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CONTENTS.

EDITORIAL 1
The New Pocket Book for Civil Engineers.
A Notable Library of Trade Publications.
CORRESPONDENCE 1
Literary Gems from Municipal Reports; Frederic I. Winslow—On Some Points in the Review of Raymond's "Field Geometry"; F. Lavis—More About Card Indexing; W. B. Rawson—A Forthcoming Bibliography of Biographies of Engineers and Other Scientists; E. H. McClelland—Correct Name and Author of an Engineer's Pocket Book Wanted; Elmer Lenfest.
REVIEWS:
Rock Drills. Reviewed by Bruce C. Yates..... 2
The National Land System of the United States.... 3
Physical Significance of Entropy, or of the Second Law 3
The Speed and Power of Ships. Reviewed by C. H. Peabody 4
Transportation in Europe 5
A Guide to Technical Writing. Reviewed by H. P. Breitenbach 6
The Mississippi River and Its Wonderful Valley..... 6
Compressed Air 7
Compressed Air Plant..... 7
Handbook for Heating and Ventilating Engineers. Reviewed by Reginald P. Bolton..... 8
Government Ownership of Railways..... 8
State Socialism in New Zealand..... 9
Practical Stamp Milling and Amalgamation—Testing for Metallurgical Processes—More Recent Cyanide Practice. Reviewed by F. W. Traphagen..... 10
Welding: Theory, Practice, Apparatus and Tests... 10
Poussee des Terres 10
Electric Motors 11
Sewage Disposal Works 12
The Practical Design of Motor Cars..... 12
Mechanical Drawing for Plumbers..... 12
A Text-Book of Elementary Foundry Practice..... 12
General Specifications for Concrete Bridges..... 13
Die Baumaschinen 13
Principles of Electrical Engineering..... 14
Die Dynamischen Wirkungen 14
Verringerung der Selbstkosten..... 14
Turbines A Vapeur 14
American Water Works Association..... 14
The Journal of the Municipal School of Technology, Manchester 14
PUBLICATIONS RECEIVED 14

EDITORIALS.

The New Pocket Book for Civil Engineers.

No announcement we could make in these columns would interest a larger percentage of our readers than the statement that a pocket book for civil engineers, new from cover to cover and on a unique plan, has just appeared. As the volume was received just before going to press we can do no more than chronicle its publication in this issue. That the volume is appropriately named "American Civil Engineer's Pocket Book" seems to be vouched for by the names of the editor-in-chief and twelve associate editiors, all well known as thoroughly representative members of the civil engineering profession of this country. These names, together with that of the well-known publishers, are announced elsewhere in this issue, under "Publications Received." Perhaps we should add, as still further evidence of the fact that the pocket book is notably a production by American engineers for American engineers that in addition to the thirteen editors still other American engineers have collaborated in its production.

A Notable Library of Trade Publications.

What is, in all probability, the largest and most complete library of trade publications in existence has recently been established in New York, for the free use of buyers from all parts of the world. The catalogs and pamphlets are filed under a number for each manufacturer, and under this number are placed all the catalogs issued by that manufacturer. Besides an index of manufacturers, there is also a very complete subject index, comprising over 12,000 entries, covering every conceivable manufactured product. Every separate product listed in many voluminous catalogs is indexed and cross-indexed individually. It is therefore possible for a buyer to find at once all the catalogs of a given firm, or all the firms manufacturing a given product and their several catalogs.

To those who are familiar with ordinary trade catalog files, such as are found in public libraries, any remarks on the usefulness of such a file as this one and on the labor involved in the indexing of it, would be superfluous. Doubtless every engineer also appreciates the fact that trade catalogs, when so arranged that their contents are accessible, form an exceedingly valuable annex to a technical library.

Besides the catalog files, private desks, typewriters, telephones and other conveniences are arranged for the use of prospective buyers. All this is maintained as an adjunct of the Commercial Bureau Co., and is supported by small annual fees paid by the various manufacturers of the country, many of whom have offices in the immediate vicinity. The library is located in the Hudson Terminal Building, 50 Church St., New York City.

CORRESPONDENCE.

Literary Gems from Municipal Reports.

Sir: As the season of the year for writing annual reports approaches, it may not be amiss to indicate how those who write them may mitigate the sufferings of those who are obliged to read them. The reports of city or town engineers, and those of water-works officials, are usually succinct and brief, too short in fact oftentimes, but it is particularly the reports of commissioners or boards which are susceptible of improvement. The authors of the latter probably fail to bear in mind that all over the civilized world the reports of even the petty officials of a small town may find a resting-place, especially in public libraries, and may be consulted for years to come. Undignified reports injure the standing and reputation of a city. The following appeared in a recent annual report of the Supervisor of Water Works of a western city of over 300,000 people [reprinted verbatim—Ed.]:

We have had several breaks in our 24-in. Mains, all happening at night, when there was no large draft on mains, and three of these Mains had been in for Twenty-five Years, and have stood the pressure when we pumped direct from 75 to 120 lbs. for Fire Pressure and they are thicker in Iron at least from ⅛ inch to 3/16 inch than our present pipe. If any one can tell me why they break, and a remedy I shall be very much obliged.

Incidentally this report sheds a sidelight on a city government permitting serious breaks to pass uninvestigated by competent authority.

The next bit of to-be-avoided literature appears in a report of a Water Board not many miles from New York, and is indicative of a desire to please by fine writing.

With that orderly and never failing regularity and precision which characterizes the immutable laws of nature, another cycle of time has come and gone since we submitted for your consideration the last annual report of this Commission a short twelve months ago. The compliments of the season are hereby most respectfully tendered the City Fathers and the good Citizens generally, whose servants we are, with congratulations also that notwithstanding the usual list of disasters the old Municipal Ship-of-State, chartered for a voyage upon the sea of popular government, has returned in safety to port, and her officers are now prepared to make a report in full measure of the many details pertaining to the voyage, over which as custodians and pilots of the charge committed to them by the people they have had free and unrestricted jurisdiction.

The following year for the same city, this gem opens the report:

Another municipal year has been added to swell the already long list of those made illustrious by enriching the record of corporate life, and soon we shall reach the half century mile-stone since an exchange of the swaddling clothes of town government was effected for more pretentious Metropolitan attire.

The next quotation is from the annual report of the Commissioner of Public Works of a city of 30,000. He writes:

In laying down the never-ending cares of the office of Commissioner of Public Works . . . (which) I now relinquish, one comes perforce to love and cherish the loyalty and truthfulness of those whom neither malice, misrepresentation nor intrigue can swerve from duty and fidelity. They are like unto a refined metal whose sterling worth must contrast with the scum and dross of its own species, to be valued and retained.

Evidently there had been friction [mud-throwing—Ed.] that year, but a published report is hardly the place in which to wash soiled material.

Frederic I. Winslow,
Librarian, Boston Society of Civil Engineers.
Boston, Mass., Dec. 30, 1910.

On Some Points in the Review of Raymond's "Field Geometry."

Gentlemen: I notice in your issue of Dec. 15 that the reviewer of a new book, "Railroad Geometry," states that the author is wrong in recommending a change in definition of degree of curve; that the profession has *long ago* condemned what he recommends, viz: 100-ft. arcs instead of 100-ft. chords. I think that the reviewer is mistaken. I know that many important railroads do not always use 100-ft. chords.

But what I want to ask the reviewer is what author or authors ever before offered this 100-ft. arc definition? Where can such a book with necessary tables be found? I think Prof. Raymond is right in this: in switch layouts, in cant of track and in many other subjects in which he departs from the practice of our worthy ancestors. Their judgment and their mathematics are not conclusive, and should not be cited as authority.

Dec. 21, 1910. Progress.

[The foregoing letter has been submitted to Mr. Lavis, who has replied as follows.—Ed.]

Sir: I do not know of any author who (writing of American practice) uses the angle subtended by the arc in defining degree of curve; I do not know of any book of tables, nor do I know of any railroads in North America where this principle has been adopted; if your correspondent does I think it would be a matter of interest to know where they are. The fact that other than 100-ft. *chords* are used, even in the United States, is well known, as may be noted, for instance, in the correspondence columns of Engineering News during April and May last; and of course where the metric system is used the chords are 20 meters; in some English colonies one chain, etc.

What I think your correspondent wanted to bring out was, that this definition had not heretofore been proposed, though I am sure Prof. Raymond would be the last to claim this. The late Geo. R. Hardy had, I think, a set of tables worked out on the basis of 100-ft. arcs; at any rate he always believed in this idea, and of course it is well known that the idea has been frequently advocated as the only rational basis for laying out curves.

The judgment and mathematics of our ancestors may not be conclusive, but they fixed the method of laying out curves by chords, and our measures in feet and inches instead of meters, and it rather looks as if they are fixed to stay, as there seems to be an impression that it would be lots of trouble to make a change, even if a *change* were desirable. The criterion in these matters is the *best current practice*, which is now pretty well standardized in this country; if that shows no change from the practice of our ancestors, as it does not in the matter of laying out curves, there is no reason to criticize it because it is old. Prof. Raymond recognizes that the chord definition is standard practice and uses it in his book but suggests that in his opinion the arc would be better.

F. Lavis.

More About Card Indexing.

Sir: Referring to your answer to my correspondence on card indexing, it may be that we have both missed each other's point. My criticism was more against the danger you speak of, that is, the discouragement of the indexer with too much promiscuous indexing. I tried it at first in much the same way, indexing what I thought was valuable information from books that I owned or had read. After five years, I culled a couple of hundred cards, covering, in the main, just this kind of information. My viewpoint of its value had changed and the outlook of continuing it to properly cover the things I might want, was appalling. I gave it up in favor of my present method of cutting out and filing the whole article or copying off the portion that I wanted. By this process one does not have to hunt up back numbers that may be difficult to locate, and when they have been bought, may not be what is wanted for the particular case. Even articles that are long out of date may be applicable on some special point, if they are at hand and can be read.

I hoped that I might point out the way for a young engineer to avoid possible discouragement through trying to do too much. Many concerns pay little attention to the ultimate disposal of the trade journals that they receive and thus he may get hold of a number of periodicals beside his own and cut out what he wants for filing. Such a file occupies little space and is always at hand when wanted.

Yours very truly,
W. B. Rawson, M. E.

York, Pa., Dec. 29, 1910.

A Forthcoming Bibliography of Biographies of Engineers and Other Scientists.

Sir: I read with considerable interest your recent editorial comment (Engineering Literature, Dec. 15, 1910, p. 53), on the scarcity of satisfactory biographies of engineers. In the work of the Carnegie Library of Pittsburg we have felt this lack somewhat keenly and have had in preparation for some time a bibliography of biographies of scientists and engineers. This list, now arranged in card index form for our own use, we hope to print in pamphlet form in the near future. It will of course add nothing to the biographical material already in existence, but will, it is hoped, serve a useful purpose in facilitating the use of much scattered material now rather difficult of access.

Yours very truly,
E. H. McClelland,
Technology Librarian.

Carnegie Library of Pittsburg, Pa., Jan. 9, 1911.

Correct Name and Author of an Engineer's Pocket Book Wanted.

Sir: Can any of your readers give me the correct name of a book of tables for civil engineers, pocket size, about 4½ × 7 × ½ ins., containing the usual tables, except that the traverse table was different from any other table I have seen in a pocket book, in that it was for ¼ degree and for distances from 1 to 100. That is the table I particularly want. The author's name, as near as I can remember was something like Sterin. If you can give me the correct name I will be greatly obliged. Yours truly, Elmer Lenfest.

Snohomish, Wash., Jan. 9, 1910.

REVIEWS.

A Practical Book on Rock Drills.

Reviewed by BRUCE C. YATES.*

ROCK DRILLS.—Design, Construction, and Use. By Eustace M. Weston, Associate School of Mines, Ballarat; Reef Lecturer on Mining, Transvaal University College. New York and London, England: McGraw-Hill Book Co. Cloth; 6¼ × 9¼ ins.; pp. 367; 193 text illustrations and numerous tables. $4, net.

Writers of engineering books need make no apology for using material collected by others, provided due credit be given. Many good books have been written, which are mere collections of data already published in fragmentary form. The one important thing is that the material be collated in concise and usable form, so that the reader may be able to separate what has been copied from what is original.

Mr. Weston has gathered together much material for a good book, which will be of practical benefit to those engaged in the operation of rock drills and to the young graduate about to enter the field of actual mining. The arrangement of some of the material does not, in all respects, conform to the standards for a good book.

Before taking up the book in detail, the reviewer will challenge Mr. Weston's statement, in his preface, that "My chief qualification for writing this book is that I have had to earn my living by using many of the machines described ——— etc." Experience is not the only qualification, and the reviewer is of the opinion that it is not the prime requisite for an author of a technical book to possess. Unless the writer is able to write from the standpoint of the reader, his book will soon be relegated to the dusty shelf, even though it contain much of value. We are too busy in these days of whirlwind progress to spend time to rearrange a poorly written book to make it usable. By this the reviewer does not wish to be understood to class "Rock Drills" under the head of poorly written books.

Chapter I. is devoted to a brief historical sketch which is of interest as an illustration that man has in all ages sought to make his brain assist his muscle in the performance of labor; and his endeavors along this line are none the less worthy of praise because they have been quickened by what is commonly called "greed for gain." The first rock-drilling machine is attributed to one Richard Trevithick, a Cornishman, in the year 1813. Brunton is credited with having suggested the use of compressed air for rock boring as early as 1844.

Mr. Weston says that "Americans claim, and I think rightly, that the first inventor of a machine embodying the principles of the modern rock drill was J. W. Fowle of Boston." Mr. W. L. Saunders, who may be considered an authority, says in an article published in "Mines and Minerals," Vol. 31, No. 1, August, 1910, entitled "The History of the Rock Drill," that the rock drill is an American invention, conceived and developed in the United States. J. J. Couch of Philadelphia took out the first practical patents in 1849. In his experiments he was assisted by Joseph W. Fowle. Hiscox, in his book, "Compressed Air and Its Application," says "that the first self-operating percussion rock drill dates from 1849 under the Couch patents." I do not attempt to say whether Couch or Fowle was the inventor of the rock drill, but quote these authorities as proving, in the main, our author's statement, although there is a difference of opinion as to which of the two men was the inventor.

Chapter II. is a fairly complete description of standard drills. The classification adopted is good, and would enable one not familiar with the different types to classify any machine coming under his observation. The author's comments and criticisms are thrown in here and there rather promiscuously with material copied from trade catalogues, which makes it difficult to tell what is original and what is copied without reading very closely. On page 10, in beginning the paragraph on piston-valve drills, the word valve is omitted, which leaves the first sentences of the paragraph somewhat ambiguous.

The author begins the section on tappet-valve drills by stating their advantages and disadvantages before describing the type. It seems hardly fair to the reader to prejudice his mind before the case has been tried. Not only is the reader's mind prejudiced beforehand, but the arrangement necessitates going over the ground again in order to see how such conclusions were reached. If the different drills falling within the classification adopted had been concisely described and illustrated first, followed by comments on their individual merits and demerits, this chapter would be of far greater value to any reader. The matter is godd and the author's position in regard to the different types is well taken. The weak points of all makes are clearly stated without favoritism. A comparison of the older makes of the same type of machine with the latest design would illustrate more clearly how these weaknesses have developed under working conditions.

More attention has been given by drill manufacturers to making a machine that is "fool proof" than one that can be operated easily and that will be mechanically correct. However, the manufacturers should not be blamed for this, as they are only trying to keep up with the demand. The fact that a salable rock drill must be "fool proof" goes to prove that mine operators have not, in the years during which this great industry has been developing, trained a class of efficient drill runners. Whether this should be charged to the mine owner, the miner and his unions, or to the character of the work will not be discussed in this review, but when this question is settled we may then have more efficient drilling machines.

The development of hammer drills is now proceeding so rapidly that no book could be up to date on this subject. The author has covered the ground as thoroughly as possible and has made forecasts as to the possibilities of this type.

The water-Leyner hammer drill long ago demonstrated its place in the mining field of America, and with the advent of cheaper and better hollow steel will come into use in general mining more than heretofore. The author says "that rotation in this machine is effected by means of three strong simple parts." After about six months use of the latest Model VI., No. 9 Leyner machines, the writer of this review has found that this is the weakest part as far as repair cost is concerned. The principle is good, but the material used is not adapted to the work. The author's objection to the welded steel shanks for this drill is now overcome by forming the shank on one end of a hollow steel tube made of regular drill steel in a bulldozer or in the Leyner Sharpener. This has been successfully done, and no trouble has been experienced from the shanks breaking. The bit is formed on the other end of the tube.

In America the development of air-hammer drills for stoping has been along the lines of the air feed and hand hammer or blockholer rather than along the lines represented by the Leyner rock terrier, Kimber and Gorden. The air-feed drill is coming rapidly into use where the vein is narrow or where good miners are scarce. It should be said, in the interests of humanity and for the ultimate good of the mining interests, that these machines as now used are dust makers. The operator must stand directly under the machine while turning it, and thus necessarily carries away a no inconsiderable part of the dust in his lungs. Colorado miners have nicknamed them "widow makers." This warning is given with due consideration and after close observation of the operation of these machines since they came into general use. Should later development be along the line represented by the Murphy and Leyner air-feed stoper, with water attachment, then this drill should have an ever-increasing field of usefulness. While the water attachment does not absolutely prohibit their use unmounted, light mountings that can be readily handled by one man will probably be the common practice.

The statement made on page 80 that with valveless drills it is necessary to have a collar on the steel, proves the statement that no book on rock drills can be up to date. The Slaw, Waugh and Ingersoll valveless air-feed drills use no collar, and the present tendency is to make all valveless air hammer drills, both air-feed and hand, to use steel without collars.

One very important part of the design of hammer drills is not mentioned by the author, and that is an automatic oiling device, with an oil cup having sufficient capacity for at least a half shift. In a mine where the labor is as good as the average and where about 300 hammer drills are in constant use fully 90% of the machines sent to the repair shop are found to be perfectly dry, notwithstanding the fact that there are no orders in this mine restricting the amount of oil that may be used.

The language in the last paragraph on page 83, which is copied from an Ingersoll-Sergeant catalog, is not very clear. After several readings of this paragraph the reviewer is not able to determine what the writer intended to say.

Electric drills are briefly described in Chapter IV., covering about twenty pages. As the author has stated, electric drills do not as yet occupy a very important place in mining operations, but they now have a limited field, and the great saving in power effected by their use warrants further efforts to bring the electric drill to a more practicable stage. The results of test runs made with electric and air drills, as given in the text, makes this chapter of interest to the engineer.

For tunnel driving where electric power can readily be obtained, the Temple-Ingersoll electric air drill has proven efficient. In a 7 × 7-ft. tunnel, which is a part of a power development scheme in the Black Hills, South Dakota, these machines have been used and the progress made has set the pace for rapid tunnel driving in that section of the country. When the number of men employed is taken into consideration the progress compares favorably with similar work elsewhere. Three shifts were employed, consisting of two drill runners, four muckers, and one gang boss. These men rigged up, drilled the ground, blasted, removed the broken rock and laid the track. The best advance for a month with two faces to work in was 399 ft. An advance of 99 ft. was made in one week, working in one face only. The tunnel was driven in limestone. The limitations of this drill are well stated by the author. Gasoline rock drills are mentioned by the author in this chapter.

Much praise is due Mr. Weston for his clear and forceful chapter on Rock Drill Operation. There can be no doubt left, after reading this chapter, that the author has actually operated drills. Every drill runner should keep the essence of this chapter well in mind, and the novice would be able to meet most of his problems by following advice here given.

Drill steel, as mentioned on page 114 and illustrated in Fig. 107, does not always solve the problem of pulling the cuttings out of flat holes. If the ground is damp, the grooves (?) simply pack full and the steel acts the same as round steel.

In a mine where any considerable number of drills are used, the practice of allowing the operator to make small repairs is questionable. If extra machines are kept either on each level or in the repair shop, if that is accessible, and the operator is required to exchange his machine when out of repair for one in good order, the life of the drills will be materially lengthened. No more time is lost and the defect is more readily detected by the repair man.

*Assistant Chief Engineer, Homestake Mining Co., Lead, S. D.

I would question the soundness of the advice given by the author to a drill operator working on a contract, to tip the rock drill fitter and blacksmith. I have known such practice to be indulged in by drill demonstrators but it should not be countenanced among regular employees of a mine.

Chapter VI., on piston drills designed to use air expansively, seems to have been misplaced. The logical place for this chapter is immediately after the chapter on Piston Drills. As has been stated, drill manufacturers have directed their attention to making drills "fool proof" and it has been left to the inventor to work out a drill that shall be an efficient drilling machine and at the same time an economical power user. In consequence the power-saving machine has been invented but not used. However, the machines described in this chapter illustrate that some attention has been given to this subject.

Chapter VII., on the philosophy of the process of drilling rock, demonstrates that the author, while getting experience running drills, brought to bear exceptional powers of observation, and has made a very able presentation of a subject, heretofore given very scant attention. The author's equation of practical efficiency should be kept in mind by every drill manufacturer as well as by every operator. The factor "W" should have a coefficient which would represent the efficiency of the operator. An arbitrary value would have to be assigned to this coefficient. The efficiency of the operator determines the efficiency of a rock drill.

The paragraph in this chapter which describes conditions under which rock drills work should be printed in large bold-faced type and posted up where he who runs (rock drills) may read.

While it may be of interest to discuss, pro and con, the merits of piston and hammer drills, the fact is they each have their place and when this has been more clearly defined we will not have the sad spectacle of seeing agents of the two types of machines trying to buy their way into a mine, and the problem will be for the prospective purchaser to study conditions and buy the machine suited to those conditions.

Repair and maintenance of rock drills are treated in Chapter VIII. It is not clear whether the specifications given in this chapter and credited to W. C. Docherty were drawn to apply in cases where the repair of machines is let out on contract or not. If so it would seem that the author has given undue prominence to the system which he justly condemns in the fore part of this chapter.

The large mining concerns in America maintain a drill repair shop in charge of a competent man, who works under the supervision of the mechanical department. A rock drill inspector whose duty would be to go through the mine and see that all machines were properly oiled, and instruct the operators how to use and care for their machine, would be a good investment, especially in large mines where there are apt to be many only indifferent operators.

The Leyner and Eclipse drill-steel sharpeners should be mentioned in Chapter IX., which treats of drill bits and sharpeners. The latter machine is built somewhat along the lines of the Word and Ajax, but the Leyner Sharpener is an entirely different type. The steel is held in the die by pressure of a large air cylinder, the shank end of the drill merely resting on a "stand." The dolly and hammer are carried by a projecting arm which is a part of the main casting enclosing the air cylinder and dies. It is a self-contained machine, requiring no special foundation, and, while it is built to sharpen any size steel, it is especially adapted to sharpen steel for air-feed and hand-hammer drills.

It is with hesitation that I undertake to review the chapter on explosives and their use. There are so many unknown quantities in the equation which represents the effect of explosives that it is almost useless for the layman to attempt to discuss the problem.

We learn by trial that so many pounds of dynamite of a certain strength distributed in a certain number of holes of a certain depth will break a "round" in a drift of certain dimensions. After we have blasted several rounds successfully we find, one day, that our experience has played us a trick and the holes have not "bottomed." Perhaps only about a foot of the collar has blown off and a large chamber has formed at the bottom of the hole. In the next round we use a little more powder and again have a failure. This goes on until it is suddenly discovered that we are simply burning up powder, or, as has been aptly said by a prominent mine manager, "having a Fourth of July celebration at the expense of the mining company." However, there are certain fundamentals governing the use and care of high explosives that should be more widely known. Mr. Weston has brought together these fundamentals in a well-written chapter entitled "Explosives and Their Use." I would especially commend what he has said in regard to the selection of detonators and how to use them, the proper way to thaw dynamite, and shot firing by electricity. The latter subject, in particular, should receive more attention in our metal mines.

The theory of blasting forms a very small part of the education of the average American miner and mine operator. Experience has been their only teacher, and judging from results, not a very good one. The tendency of present American practice is toward the use of higher power explosives in metal mines and in tunneling. To some extent this is due to the introduction of smaller and lighter machines, such as air-feed stopers, which are capable of drilling holes of small diameter only.

Chapter XII., on rock-drill practice, brings together much information that has already been published in the technical press and much that is new. In most cases condition and character of ground and methods of stoping are given with great detail, which makes this information of value. Labor conditions on the Rand are so different from those of America that it is hard to make comparisons. Here, labor costs form such a large factor as compared with any other item that the efficiency of labor determines the cost of mining more than the character of the ground.

From examples given it seems to be almost universal custom outside of the United States to use welded steel. The present American practice is to purchase commercial lengths of plain round or octagonal bars and form the bit and shank by upsetting the bar after it is cut into the desired lengths.

A very interesting and instructive table could be prepared from the data given in the text showing the type and size of drills, kind and power of explosives, kind and size of steel and many other things of interest that are used in the different mining districts.

Rock-drill tests are described and the results tabulated in Chapter XIV. Of these the most elaborate and, I presume, the most accurate, is the test of stope drills, made in South Africa at the Robinson Mine. Prof. Orr and his associates deserve much credit for their work in carrying out this test and giving the results to the world.

Dust and its prevention is treated in Chapter XV., covering 13 pages. It is presumed that the author deemed his duty fully performed by describing some of the appliances for the prevention of dust in drilling. A review of the laws of different countries pertaining to this subject and some statistics on the prevalence of and fatalities due to miners' phthisis would be of interest.

The last chapter of this book is a very short one on compressed air, the most important part of which is maintenance of pipe lines and air hose. The author's conclusion that *maintenance* is the main lesson learned from a study of rock drills falls short of the mark: From experience and study the reviewer would add that *higher air pressure* and *better drill steel* will solve many problems.

In concluding, the reviewer wishes to commend the author for the valuable information that he has presented to the mining world in this the first book on Rock Drills. There are but few typographical errors, the type is good and the arrangement on the whole such as to make the volume a reference book for the busy man.

The Beginnings of Our National Land System.

THE NATIONAL LAND SYSTEM OF THE UNITED STATES, 1785-1820.—By Payson Jackson Treat, Ph.D., Assistant Professor of History, Leland Stanford Junior University. New York: E. B. Treat & Co. Cloth; 6¼ × 9 ins.; pp. 426; five maps; nine appendixes. $2.50, net; postage 20 cts. extra.

The object of the author in preparing this study, together with the general scope of the book, is well indicated by the following extract from the preface:

It is the purpose of this study to show how the national public lands passed into private ownership during the first great period of our land system. It is concerned, therefore, only with the disposal of the lands by the nation, it does not presume to discuss the uses to which the lands were put. It considers the land grants for education, for example, merely as a way in which great areas passed from the public domain to the control of the States; it does not work out the management of those grants. In short, it deals with the origin of the public domain and with every form of disposition which was in use before 1820.

The author first traces the origin of the public domain, including the land claims founded on the original charters of a number of the colonists and the cession of these rights to the nation by the several States. In the next seven chapters he takes up in detail the various Congressional Land Acts providing for the sale of the public domain and the administrative practices that resulted therefrom. The eighth chapter is entitled "The System of Surveys." In it is given a brief account of the surveying methods practiced up to 1820. Subsequent chapters deal with the confirmation of foreign titles, land grants for (1) military and naval services; (2) education; (3) various public and private purposes. These chapters are followed by one on "The Satisfaction of the Conditions in the Deeds of Cession, 1784-1802"; that is, the conditions laid down by the several States in ceding their lands to the United States. The final chapter takes up the land system and its relation to the "Westward Movement."

Although the author stops with legislative and administrative measures adopted up to 1820, in a number of instances he traces subsequent developments down to 1907, so far as these were based on earlier legislation.

The author does not hesitate to pass unfavorable criticism upon the manner in which the public domain was administered up to 1820, yet, on the whole, his attitude is one of sympathy with the practical problems which confronted those who had to do with the early attempts to gain the largest possible revenue from the public domain, while at the same time encouraging the settlement of vast new areas.

The work appears to have been done with great care, and the book as a whole is an interesting study of the subject. The author suggests that if the study were to be brought down to date, it would be well to have the second period

end with the Preemption Act of 1841, the third with the Homestead Act of 1862, and the fourth with the rise of the Conservation Movement, which certainly marks a new period in our land history.

We trust that the present volume will meet with such approval as to encourage the author to continue his studies along the lines suggested.

PHYSICAL SIGNIFICANCE OF ENTROPY, OR OF THE SECOND LAW.—By J. F. Klein, Professor of Mechanical Engineering, Lehigh University. New York: D. Van Nostrand Co. Cloth; 6¾ × 9¼ ins.; pp. x + 98. $1.50, net.

The author "has in the main sought to present the interpretation reached by Boltzmann and by Planck" concerning entropy; presumably he endeavors to reproduce in easily understandable form the reasoning by which the two German physicists deduce thermodynamic principles from a mathematical study of molecular interactions. It has been said of certain great scientists that they possessed the magic power of setting forth the most recondite subjects in an easy, "popular" way. Prof. Klein gives no evidence of this power. His style in this book unfortunately is either stenographic or disjointed to a degree that makes his course of thought hard to follow. In trying to go beyond a mere statement of conceptions and method, and yet shrinking from resort to mathematical reasoning, he has largely missed his purpose. We venture to say that the net yield of the book, for most persons, could be put into a few pages.

Marine Propulsion.

Reviewed by C. H. PEABODY.*

THE SPEED AND POWER OF SHIPS.—A Manual of Marine Propulsion. By D. W. Taylor, E. D., Naval Constructor, U. S. N.; Vice-President Society of Naval Architects and Marine Engineers, Mem. Institution of Naval Architects. In two volumes. First edition. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth: Vol. I., Text; 6 × 9¼ ins.; pp. 314. Vol. II., Tables and Plates; 12¼ × 9½ ins.; 15 tables; 277 illustrations. $7.50, net; English price, 31s. 6d., net.

Ten years ago Naval Constructor D. W. Taylor, U. S. N., announced to the Society of Naval Architects and Marine Engineers that the United States Experimental Model Basin was completed and had been in service during the preceding year. The conception, design and construction of the Model Basin and the prosecution of 'experiments on ships' models and propellers, together with many other investigations, have given Mr. Taylor the opportunity to take his place as a leader in the science of naval architecture.

The work of the Model Basin is primarily to determine experimentally what form shall be given to warships for certain services so that they may be driven with the least expenditure of power. It is to be noted that a reduction in resistance of the ship comes in a geometrical ratio, first in the size, weight and cost of the engines and boilers, second, in the cost of coal and the space and displacement to carry it, and thirdly, in the size and displacement of the ship which must carry its own structure, the propelling machinery and fuel, the crew and supplies, and finally, that for which the ship exists, the armor and armament. It may well happen that the solution of the best form for a class of ships may save enough to pay for the equipment of the basin and for its maintenance for a term of years.

In addition to work for the Navy Department the Model Basin has carried on investigations for private parties (towing models and trying propellers) to an extent which is little realized, for the information in such cases belong to those for whom it is obtained and they properly keep it to themselves.

But in order that the Navy Department may decide promptly on types of ships to be constructed, information such as the Model Basin can supply should be at hand before the design of the type is seriously undertaken. Therefore, the staff of the Model Basin, under the direction of Mr. Taylor, has from the beginning been accumulating data concerning ships and propellers with all kinds of variations that can come up in service. After such information has been obtained, digested and systematized, it is easy for Mr. Taylor's force to report promptly the probable power for a certain type of ship and the advantages and disadvantages of various modifications.

This accumulation and systematization of information must be done before any model basin can carry on work advantageously. Hitherto the governmental and private experimental stations have generally treated such information as confidential or as private property. There have been exceptions to this policy and the profession has been indebted to the British Admiralty and to certain private firms for highly-prized information. With characteristic liberality the Government has given Mr. Taylor freedom in publishing results of investigations made at the Model Basin, and his contributions to the science of naval architecture in the form of memoirs to learned societies compare favorably with the entire information given by other writers.

This long preamble to the review of Mr. Taylor's book is justified, if not necessary, in order that the book may be properly appreciated by those who are unacquainted with one of the more unfamiliar branches of engineering, for in that book there is presented the great body of information referred to; presented, too, in convenient form for ready use, together with a collection of material from other sources, all united in such a way as to form a manual of marine propulsion.

The book opens with a brief but clear statement of the theory and application of stream lines and a discussion of the theory of waves and the theory of mechanical similitude. Also there is given a ready way of estimating the wetted surface of a ship from its main dimensions, the importance of which is evident when it is remembered that the surface friction forms from half to three-quarters of the entire resistance of a ship.

The chapter on resistance opens with a statement of the usual separation into skin-resistance, eddy-resistance, and wave-resistance; all but the first are commonly treated together and called residual resistance. This residual resistance varies so widely and so erratically that there is but one way of determining the effect of variation of form, and that way is by towing models in the basin. This investigation has been carried on under Mr. Taylor's direction for a wide variety of forms of hull, the variation being purposely extended in every way, far beyond practical limits. Having determined that variations of form of midship section have comparatively little effect on resistance, he has been able to base the determination of residual resistance on two factors, (1) speed-length ratio and (2) displacement-length ratio. The first is the ratio of the speed in knots to the square root of the length in feet. The second is the ratio of the displacement to the cube of the length; a factor, $1{,}000^3$, is thrown in as a matter of practical convenience. Forty diagrams for residual resistance are given, from which one may readily select the factor for any given case, and therefrom a simple calculation can be made for the power to overcome the residual resistance. As a convenience in the use of this method Mr. Taylor has constructed a diagram from which the frictional resistance can be estimated in the same terms as the residual resistance, so that but one computation need be made for the effective power for driving the ship, not allowing for appendages or the effect of the location of the propeller.

These forty diagrams of residual resistance enable a naval architect to estimate the effective horsepower for a given ship with certainty and precision, and in many cases eliminate the necessity for model experiments. Naturally, Mr. Taylor selected a good form for the basis of these curves and the power estimated from them is that for a ship having the minimum resistance. He gives the lines of the model and the methods of varying lines so that, if conditions allow, the naval architect may take advantage of the best form. Moderated variations may be allowed for by use of a little discretion; extraordinary forms will, of course, call for special investigations. It is impossible to exaggerate the importance of this information, especially as it covers a field for which there has hitherto been no published information.

In the same chapter consideration is given to the effect of shallow water, to the best way of ensuring good speed in rough water, and to the resistance of such appendages as keels and supports for propeller shafts.

The third chapter, which deals with propulsion, is based on experiments on propellers in the Model Basin. These experiments may be accepted as conclusive so far as the properties of propellers themselves are concerned. In the first place experiments on variations of form were made, which showed that the accepted form, with elliptical contour of blade, and little or no rake, was as good as any form that could be devised. This sweeps away forever the whole brood of freak propellers, which in itself is worth the effort of and expenditure for the experiments.

Having cleared the field and determined the range of allowable variations, Mr. Taylor chose for the basis of design thirty propellers of varying width of blade and pitch-ratio; by making the blades thick at first and thinning them progressively these were made to represent 120 conditions covering the entire range of propeller design. From the tests of all these model propellers there have been constructed four diagrams for determining the diameter of a propeller for any given case. Having determined the power and revolution of the engine to drive a ship at a given speed, and making proper allowance for the effect of the wake, the designer makes a simple computation and with the resulting function enters one of the four diagrams, and selects the function for finding the diameter of the propeller. Another simple computation with the diameter function gives the diameter of the propeller in feet. At one and the same time the designer may select the diameter function and read from the diagram the pitch-ratio, real slip and the efficiency, so that one operation determines all the properties of the propeller. As a guide to the selection of the best propeller a special curve is drawn across each diagram; the designer will select the diameter function on or near this curve if possible, but if for any reason the first computation for diameter gives an unacceptable result the designer can see at a glance what he must pay in efficiency for variation from standard conditions. The diagrams are for three-bladed propellers, but with a little more trouble can be used for four-bladed propellers, as well, or even for two-bladed propellers.

The standard propellers are given varying thicknesses of blades, narrow blades being relatively thick and wide blades thin. If required, the thickness may be increased or if conditions warrant the advantage of a thin blade may be had by making a small allowance.

The determination of the strength of a propeller blade is unavoidably difficult and uncertain and yet it must be made if the designer desires safety and good efficiency. With skill and good judgment Mr. Taylor has threaded this maze and has given diagrams from which the proper thickness of blade may be determined with comparatively little effort. The wide variation of blade thickness in common practice shows the need of such a method.

The book ends with chapters on the making and analyzing of speed and power trials, and on the powering of ships, in which the author gives the advantage of his experience, which has been wide and varied. The difficulties and means of meeting them are brought out clearly.

There remains but one field for which the information is incomplete and that is the investigation of the interaction of the hull and the propeller; technically, the determination of the wake gain and the thrust deduction. Some information we have, and in usual conditions a small error of estimation of these features will have little effect. But we must wait for future investigations at the Model Basin to settle this matter authoritatively and place the science of naval architecture on a sure foundation.

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COMMONWEALTH OF PENNSYLVANIA.—Third Annual Report of the Commissioner of Health [Samuel G. Dixon] for year 1908. Harrisburg, Pa.: Pub. Doc. (No. 17). Cloth; 6¼ × 9½ ins.; pp. 1339; one folding map, numerous text illustrations and tables.

More than half the pages in this volume are given up to a very detailed account of the doings of the Division of Sanitary Engineering, which is under the direction of Mr. F. Herbert Snow, M. Am. Soc. C. E.; and since most of Mr. Snow's report is in small, unleaded type, it seems safe to assume that two-thirds of the actual number of words in the volume relate to the work Mr. Snow is doing. This appears to us significant as showing the part played by engineers and engineering in the work of a progressive and efficient state board or department of health. A considerable portion of the space occupied by Mr. Snow's report relates to applications, permits, and decrees for water-works, sewerage and sewage disposal. A number of pages are devoted to typhoid fever epidemics, the most important of which appears to be the one at Reading, Pa., in the latter part of 1908.

It is interesting to note that apparently the State of Pennsylvania, through its Commissioner of Health, supplies disinfectants to local health authorities. It may be added that the state and local health work in Pennsylvania seems to be unified far more completely than any other State.

It seems a pity that reports of this character cannot be published more promptly. The report before us, although for the year ending Dec. 31, 1908, is dated Dec. 31, 1909, but our own copy was not received until Dec. 12, 1910.

Water and Rail Transportation in Europe.

TRANSPORTATION IN EUROPE.—By Logan G. McPherson, Lecturer on Transportation at Johns Hopkins University. New York: Henry Holt & Co. Cloth; 5 × 7¾ ins.; pp. 285; one map. $1.50, net; by mail, $1.62.

The author of this book accompanied the National Waterways Commission to Europe in the summer of 1909 and spent six months in the study of European practice in rail and water transportation under the auspices of the Commission. The book before us is in the main a rearrangement of the formal reports made by the author to the Commission.

The scope of the book may be comprehended from the titles of the principal chapters, as follows: "Land Roads and Interior Waterways," "The Development of the Railways," "Railway Passenger and Freight Tariffs," "International Rail Traffic," "Phases of Government Control," "Comparative Usefulness of Inland Waterways and Railways," "Transportation in England."

The author's conclusions regarding the relative economy of water and rail transport are in brief that the European inland waterways are for the most part kept in operation only through the fostering care of the state. He says:

> That the Rhine and the other rivers which are practically estuaries of the sea, penetrating regions of developed traffic, are and will remain useful instruments of transportation is beyond question. But this is because they are estuaries and because they penetrate such regions and not because of the intrinsic superiority of waterways for inland traffic.

In Germany, 43% of the entire inland water traffic is carried by the Rhine and 24% by the Elbe.

Mr. McPherson quotes at length from M. Ives Guyot, who was Minister of Public Works of France from 1889 to 1892. M. Guyot shows that the taxes and other burdens placed by the Government upon rail traffic in France amount to $52,000,000 annually and declares that, "if a corresponding burden were placed upon the boats they would all be at the bottom of the canals."

Probably the most valuable chapter in Mr. McPherson's book is that in which freight tariffs and freight traffic are described. In view of recent discussions of the relative cost of terminal expenses and road expenses on American railways, it is interesting to learn that on every freight shipment in Germany a terminal charge is made, separate from the road charge. Another notable fact is that in many European countries goods are carried in train load lots for a much lower rate than in single cars. Besides:

> In Germany, the railways are bound to despatch quick-service freight from the station within one day after receipt and to carry it at least 198 miles a day to destination. Ordinary service freight must be dispatched within two days and must go at least 66 miles the first day and 132 miles each succeeding day.

While there are many such facts as these in the book the general tone in which it is written is one of criticism of the Government-owned railways of Europe and defense of the American railway system, and this tone is so predominant as to greatly weaken the force of the author's conclusions in the mind of the critical reader.

The author may have intended to be perfectly fair in his discussion of European railway management; but the tone of depreciation recurs so constantly that the reader is likely to be deceived. Certainly the prevalent impression among many American railway officers who visited Germany this year in connection with the International Railway Congress is that the German railways rank with the most efficient and well-managed in the world.

Two facts which the student of foreign railway conditions ought to constantly bear in mind are that the railways of Europe are working under vastly different conditions from the railways of America and that railway methods may be vastly different there from what we are accustomed to regard as best here, and yet not be deserving of criticism. It is doubtless true, for example, as Mr. McPherson claims, that the Government-owned and state-controlled railways of Europe have freight tariffs much more rigid than our own; but we seem to have heard suggestions that the extreme variation to which American freight rates have been subject, has certain drawbacks as well as certain advantages. Mr. McPherson is an able advocate, but we fear he cannot qualify as a judge.

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Technical Writing.

Reviewed by H. P. BREITENBACH.*

A GUIDE TO TECHNICAL WRITING.—By T. A. Rickard, Associate of the Royal School of Mines. Formerly Editor of the "Mining and Scientific Press." Editor of "The Mining Magazine." Second edition. San Francisco, Cal.: Mining and Scientific Press. London, England: The Mining Magazine. Cloth; 5¼ × 7¾ ins.; pp. 172. $1, postpaid.

Why do so few engineers succeed in business affairs? Why do not engineers participate in politics? Why are engineering structures unæsthetic? Why are the writings and speeches of engineers so inelegant? These and many similar questions have formed the subject of numerous letters in the technical press, addresses to engineers and students of engineering, pamphlets, and even books. In most cases the authors of these have been engineers.

The fact that such subjects have arisen for discussion among technical men is itself significant. It indicates that they are appreciating the larger functions that the engineer should fulfill, but as yet fulfills only imperfectly. Up to the present time he has not been trained for the larger opportunities. His education, consisting mainly of physics, chemistry, mathematics and mechanics, has been limited to the world of matter and the forces of nature. The "use and convenience of man," the world of human interests, has been neglected. Such a narrow education has been unfortunate for two reasons. The first, that the engineer is himself a human being and therefore craves a normal full development, cannot be discussed here. The second is that engineering itself involves intimate relations with human beings. Every important engineering work that the engineer undertakes requires of him consultations with its projectors, committee work, discussion with associates, the control of subordinates, the consideration of the public welfare, etc., etc.

The customary education of the engineer, however, has not trained him for such functions. Its foundation has resided in mechanical and mathematical principles. But at every point where engineering touches human beings—and these are many—mechanical or mathematical principles are altogether inadequate. In business, in art, in politics, in short, wherever human interests prevail, such principles penetrate but a little way. In the industrial world at present the greatest problem of the employer is to secure the loyal and efficient cooperation of his employees. In the field of art much was formerly expected of æsthetic science based on mathematics, but it has not afforded any noteworthy insight. Even "machine" politics is a misnomer, if the name is taken in any literal sense: the practical politician is one of our shrewdest students of human nature. In all these fields the engineer comes into contact with human problems; but for solving them his education has not prepared him. He has not learned—at least, not in school—the principles that control the engineering of men.

Yet it is an auspicious sign that, as noted before, technical men themselves are awakening to this deficiency of theirs. Engineering schools, too, are offering five-year and six-year courses in which the student may receive more adequate preparation for the duties of his intended profession; in some schools a literary course is a prerequisite to the technical work; nearly every school at least makes a show of including courses not too narrowly technical. But on the whole, the situation is not yet fully comprehended, nor are the remedies provided yet adequate. That great educational problem in which it is involved—the proper relation of practical and cultural training, still awaits fundamental exposition and solution.

In "A Guide to Technical Writing" a part of the subject under discussion has received some attention in its practical aspect. "To help those who wish to write clearly on technical subjects" is the avowed purpose of the author. But of the larger implications of the matter, such as are suggested above, the book contains little or no recognition.

The contents of Mr. Rickards book would better warrant such a title as "Technical Diction." It is largely devoted to criticism of various classes of words prevalent in the writings of mining engineers: colloquialisms and provincialisms, such as "ledge" for "vein" in California, "rock" for "ore" in the Lake Superior region, "drive" for "drift" in Australia; misused professional titles, as "professor" and "doctor"; bombastic terms, frequently found in mining exploitation and not absent from the writings of scientific and professional men; and others of like nature. Parts of the book also point out the correct use of abbreviations, numbers, hyphens, etc. Much of this comment is such as appears in "style-sheets" prepared by editors to secure uniformity in their publications. Finally, the author discusses a few slightly broader subjects, including the education of engineers in language and the "standardization" of technical English. All these matters are treated in an interesting, piquant fashion with here and there a sapient idea or a flash of wit, an illuminating quotation from Huxley or a characteristic bit of the author's own editorial experience.

As a "guide" to technical writing, however, the book has serious limitations, besides the narrowness of its scope already referred to. Its basis in the science of rhetoric is antiquated. The author fails at times to recognize that in such matters as arriving at a choice among alternative expressions, authoritative usage is the final court of resort. Too often he gives judgment arbitrarily, on personal or purely theoretical grounds. More important is his inadequate conception of the relation of thought to language; he adopts the superficial view that language is "the vehicle of thought" or "an instrument for transmitting ideas," and in this he bows down to Herbert Spencer as an authority. In the opinion of modern students of the subject, the relation is much more intimate. Not to enter here into a technical discussion, it suffices to say that thought and expression are practically inseparable. In its utilitarian phase, this principle denotes that good writing begins with, and, in a large sense, comes near ending with, good thinking. Finally, the author's conception of composition itself—so far as he exhibits one—seems based upon obsolete or obsolescent rhetorical theory. Students of language are abandoning the mechanical concept of composition, which regards it as somehow adding ideas one to another, or putting them together as a machine is put together. There now obtains a more fundamental concept, in which the process of composition is thought of as organic, each part functioning in vital relation to every other part as well as to the whole. When this principle is used as a guide, the practice of composition assumes an essentially different character. Mr. Rickard's book itself is a speaking witness of the inadequacy of his rhetorical principles, at least in the present instance. A glance at the table of contents at once reveals the sadly unorganized condition of the material included.

For engineers, then, the value of the book should consist principally in calling their attention to numerous inaccuracies in the use of language to which some members of their profession are addicted. As a guide to technical writing it may prove misleading by pointing out the wrong road to follow; but by indicating certain minor pitfalls that beset the way of the unwary, it should subserve a humbler, though still useful, purpose. The present-day practicing engineer, therefore, who perhaps had no college training in composition, or who passed unscathed through a brief course in rhetoric more or less formal in its nature, is still in need of a book that will serve as a guide to technical writing. Of the many text-books now in use in college classes in English several have been prepared by instructors in engineering schools; nevertheless, they are, for the most part, merely the ordinary text-books slightly revised. Not one is in any real sense adapted to the use of engineering students, still less to that of practicing engineers. But it is only fair to add that, to the present writer's knowledge, at least two books designed to fill these needs are in preparation.

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Our Greatest American River.

THE MISSISSIPPI RIVER AND ITS WONDERFUL VALLEY.—Twenty-seven Hundred and Seventy-five Miles from Source to Sea. By Julius Chambers, Fellow of the Royal Geographical Society; Member of the National Geographic Society. New York and London: G. P. Putnam's Sons. Cloth; 6¾ × 9¾ ins.; pp. 308; 80 illustrations (3 maps). $3 net.

One by one the principal rivers of the United States are being covered in the volumes making up the "American Waterways Series" issued by the above-named publishers. The present volume seems to be a worthy addition to the list. Certainly, its subject is such as would inspire any author who had the capacity for giving it adequate treatment.

After a few introductory pages dealing with more or less traditional stories relating to the early history of the river as known to white men, the author takes up the French explorations, beginning with those of Jacques Cartier, and including Groseilliers and Radisson, Allouez, La Salle, Joliet and Marquette, Hennepin and others. In the succeeding chapter explorers from Johnathan Carver to William Morrison are considered. The author then diverges from the story of exploration long enough to briefly outline the Louisiana Purchase. He then resumes with a brief chapter on the Lewis and Clark Expedition up the Missouri and down the Columbia to the Pacific Coast at Portland, Ore. This chapter contains only a trifling amount of information regarding the Lewis and Clark Expedition, and closes with an anticlimax in which a pedantic listing of titles of epics, romances, etc., relating to the Trojan War, the Fall of Rome, the Norse Heroes, and the like, and including among others the "Iliad," the "Anabasis," the "Romance of the Rose," and "Jerusalem Delivered," is followed by this sentence:

> Lewis and Clark gave to English literature Irving's "Astoria" and "Captain Bonneville," Parkman's Histories, Theodore Winthrop's "John Brent," Bret Harte's Tales and Joaquin Miller's verses.

Why, we venture to ask, not include Mark Twain's "The Jumping Frog of Calaveras County"?

After this flight the author returns to the Mississippi once more and devotes a chapter to various explorers, begining with Zebulon M. Pike and ending with the Italian, Beltrami. Next the author gives a chapter each to the expeditions of Schoolcraft (1832) and Nicollet (1836): the first the discoverer of Lake Itasca and the second the man who made "the first real investigation of the sources of the Mississippi."

At this point our author introduces an interesting personal narrative of a trip made by himself in 1872 from the source to the mouth of the Mississippi, incidentally bringing in his own discovery of Elk Lake, which lies a little beyond Lake Itasca, the commonly credited main source of the Mississippi. A large part (the upper) of this journey was made in a canoe.

Discovery and explanation having been covered the author gives a short chapter on Itasca State Park, established by the State of Minnesota. After this the levees and jetties of the Mississippi are described, and an account is given of the lakes-to-the-gulf waterways movement.

About 40 pages are devoted to "The Mississippi in War," including struggles with Indians, the final defeat of the British at New Orleans and various notable battles on the Mississippi during the Civil War.

For some reason hard to explain, except that it affords the author an opportunity to interject an interesting story, a chapter on "The Mississippi Bubble" is included. This is followed by brief accounts of the leading cities on the Mississippi River.

The book includes a large amount of history and adventure told in a readable manner. The illustrations are well chosen and handsomely presented, and add greatly to the interest and attractiveness of the volume. The typography and presswork also deserve commendation. The index seems brief, considering the large amount of material presented relating to the history and exploration of the river, but apparently it serves to call attention to the main facts and incidents recorded. Entries under such heads as "Gambling on Mississippi Steamboats," "Inquisition, at-

tempt to introduce the, in Louisiana," "Nauvoo, the sacred town of Mormonism," "Newspaper, first, in upper Mississipi Valley" and "Timber-cruiser, the, his solitary life" serve in part to indicate the variety of subjects which have been given attention in this interesting story of the "Father of Waters."

Two Books on Compressed Air.

COMPRESSED AIR.—Theory and Computations. By Elmer G. Harris, C. E., M. Am. Soc. C. E., Professor of Civil Engineering, Missouri School of Mines. New York and London (England): McGraw-Hill Book Co. Cloth; 6¼ × 9¼ ins.; pp. 123; 5 plates, 13 tables and 14 text illustrations; appendices. $1.50, net.

COMPRESSED AIR PLANT.—The Production, Transmission and Use of Compressed Air, with Special Reference to Mine Service. By Robert Peele, Mining Engineer and Professor of Mining in the School of Mines, Columbia University. Second edition, revised and enlarged. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 6 × 9¼ ins.; pp. 502; 209 text illustrations. $3.50, net; English price, 15s., net.

Professor Harris states that his book is written to present the mathematical treatment of the problems in the production and application of compressed air, and that he has made no attempt to adapt the volume "to the use of the self-made mechanic." He has written the book, "for college-bred men, believing that such only, and only the best of such, should be entrusted with the designing of compressed air installations." The author further remarks that, "prerequisite to a successful study of compressed air is a thorough training in mathematics, including the calculus." With such a warning we are not led to expect an excursion through this book to be a summer holiday; and we are not disappointed. It is "heavy reading" all the way through.

The first and most important chapter of the book is entitled "Formulas for Work," and deals wholly with computations in connection with air compression and expansion. Chapter II. relates to the measurement of air. The author advises the measurement of air by allowing it to escape through standardized orifices, and inveighs against measurements depending on piston displacement of compressors on account of the variation in volumetric efficiency.

Chapter III. refers to friction in air pipes. The author throws overboard the formulas, rules and tables in present use for pipe friction and efficiency of air transmission and offers his own "rational" formula. Chapter IV., entitled "Other Air Compressors," is only four pages in length and gives a very cursory discussion concerning hydraulic and centrifugal compressors. Chapter V., entitled "Special Applications of Compressed Air," takes up the "Return Air" system of power transmission and of pumping by direct displacement, including the Shone ejector pump. Chapter VI. contains eleven pages on the air-lift pump, an apparatus to which the author has devoted especial attention, as an inventor. The remainder of the book is devoted to "Examples and Exercises," in which problems in compressed air work are stated and the method of solution is shown, and to diagrams and tables for use in computations.

The title to the first edition of Prof. Peele's book was "Compressed Air Plant for Mines." In reviewing this edition (Sept. 17, 1908) we noted that the book was for the most part as valuable to other users of compressed-air machinery as to mining engineers. The author and publishers appear to have realized this, as the present edition has the title "Compressed Air Plant," although a subtitle refers particularly to applications of compressed air to mine service.

The new edition has been enlarged by the addition of some 135 pages of text and illustrations. A large proportion of this new matter relates to rock drills, coal cutting machines and channelers, a department of compressed air work which received very brief treatment in the first edition. The chapter on the theory of air compression has also been extended and some useful records of air compressor tests have been added.

In its present form we feel that the book is deserving of high praise. Nowhere else that we know of has present day machinery for the pro-

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duction and utilization of compressed air been described with anything like such completeness. With the steadily increasing use of compressed air and the need for a more general understanding of its uses and possibilities by engineers, the book is a welcome addition to engineering literature.

Heating and Ventilation.

Reviewed by REGINALD P. BOLTON.*

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS.—By James D. Hoffman, M. E., Professor of Engineering Design, Purdue University; assisted by Benjamin F. Raber, B. S., M. E., Instructor in Engineering Design, Purdue University. Lafayette, Ind.: The Authors. Flexible morocco; 4½ x 7 ins.; pp. 315; 109 text illustrations; appendix, with tables and diagrams. $3.50, postpaid.

As its title implies, this little book brings together in a convenient form the matter relating to modern practice in heating and ventilation. It is evidence of the growth and scope of that art, that such a condensed form of the available material should be found desirable, and even necessary. Much of the theoretical and established matter in this condensation has been derived from a variety of scattered sources, the extent of which is indicated by the references given to authorships on each branch of this many-sided subject, but this fact only illustrates the value of such a compact compendium to those whose opportunities for access to such references is restricted, or whose time for such desirable research is limited.

There is a value in such compilations of existing material, not only in the grouping and order of arrangement of the matter, but in the summarizations of each subject, and the selection of demonstrations, and these are very evident features in Prof. Hoffman's lectures, which have not only comprised the matter, but evidently included the methods of the book. Of such is the summarization of the subject of Ventilation, in which after pointing out the indeterminate character of erratic tests of air for contained impurities, the author concludes that

> the only safe method in rating ventilating systems is to require a minimum air-supply in addition to a maximum possible percentage of CO^2.

On the other hand, in the presentation of the subject of heat losses from buildings, the author cursorily discusses the subject of infiltration of air into buildings in a single paragraph, concluding with the rather inexplicable assertion:

> In rooms not heavily exposed, or in touch with heavy winds, two changes per hour may be safely allowed for all leakage losses,

by which the reader is left to arrive at his own conclusions as to what the relative "heaviness" of exposures and winds may be, with an inconclusive and empirical allowance therefor.

The art of computation of heat-losses has advanced beyond the point of making such empirical additions as are given in Table V., which may vary a hundred per cent. according to the guess of the computer, and it cannot therefore, be claimed for them, as is done by the author, that such values "will give satisfactory results." It must, however, be admitted that this is a branch of the art in which much remains to be investigated and determined.

On the subject of furnace-heating the author makes the commendable statement that

> ideal conditions will be reached when the architect provides air-shafts of sufficient size to accommodate either a round or a nearly square stack. When this time comes a great many of the furnace-heating difficulties will have been solved.

The illustrations in the book are not of the same order of merit as the matter, in many instances the details are rendered illegible by over-shading and over-crowding. And a further detail for improvement of future editions would be the tabulated arrangement of the references to other publications.

The important subject of air "washing" and humidification is accorded scant consideration, though the author admits that "in crowded city districts . . . purification and moistening becomes a most important problem." The engineer desirous of solving such a problem will not find much comfort in the reference to trade literature for details on a subject which is in the forefront of the march of progress in ventilation at this date.

Similarly scant attention is given to the detail of driving connections between fans and other operating engines or motors, some description of up-to-date methods in which would have been of direct value. Without explanation, the reference to "noiseless chain drives" becomes misleading, since such devices are sometimes far from being noiseless.

The chapters devoted to district heating are excellent in arrangement, and to many engineers will afford new material for consideration. The author explodes the oft-repeated theory of over-enthusiasts as to the superior heating value of exhausted steam, and concludes:

> Saturated steam at any stated pressure always has the same number of B. T. U. in it, no matter whether it is taken directly from the boiler, or from the engine exhaust, but a pound of the mixture of steam and entrained water, taken from engine exhausts, should not be considered as a pound of steam.

The author has given no data bearing on the important feature of load-factor in connection with district or other heating by exhausted steam, except to give an instance by computation in which the figures stand for only five hours out of twenty-four hours. There is more material and information available upon this subject than that contained in the references, and the reader is left without consideration of the vagaries of heating demands and their relation to the variation of the exhausted supply.

The foregoing remarks are not intended to detract from the general value and usefulness of the hand-book, but rather to suggest material which in later editions may be desirably included, as the past history of other technical hand-books seems to indicate will be the case with Prof. Hoffman's latest addition to the list.

*Consulting Expert Engineer, 527 Fifth Ave., New York City.

Government Ownership of Railways.

GOVERNMENT OWNERSHIP OF RAILWAYS.—Considered as the Next Great Step in American Progress. By Anthony Van Wagenen. New York and London, England: G. P. Putnam's Sons. Cloth; 5 x 7¾ ins.; pp. 256. $1.25, net.

At first thought one may be tempted to put this book aside as another production of an idle theorist. We do not think it wise to pass over this book in such a way. There is a good deal of reason to believe that Government ownership of railways is gaining strength in the popular mind with every passing year. Books like this ought not to be ignored. The time may come when the movement for Government ownership and operation of American railways cannot be waved aside with ridicule. The time may come when it will be necessary to show people by solid definite arguments that the system we have thus far followed of private corporation control and operation of our steel highways is really the best for the public as a whole.

In his introduction the author of this book shows that only 4 nations out of 54 have no Government-owned railway lines and that in all the leading nations of the world, with the sole exception of Great Britain and the United States, Government ownership of railways is the rule and private ownership the exception. Furthermore, 32 of these 54 nations own substantially all their railway lines.

The author also summarizes the extent to which Government ownership of railways has been adopted during very recent years, notably the action of Switzerland, Italy, Japan and Mexico. He quotes the warning of President Hadley, of Yale University, that forces are at work promoting the policy of Government ownership "which may prove all but revolutionary when the question does come under discussion."

For these and many other reasons we heartily agree with the author when he says that, "as the world is now moving, Government ownership is sure to be a burning issue in this country within a very short time."

Turning now to the author's arguments for Government ownership, their scope may be best appreciated by quoting the titles of some typical chapters as follows: "Weakness of Private Management," "Will the Government be as Enterprising as Private Corporations have been in Extending the Service of the Railways?" "Government Ownership and Federal Patronage," "Is Government Ownership Socialism?" "Government Ownership and States' Rights," "Freight Rates Under Government Ownership," "The Source of Railway Political Power."

We commend this book particularly to those of our readers who have to do with railway operation. Such men ought to understand the point of view of men like the writer of this book. While the author betrays his lack of knowledge of transportation methods and economics in many ways and while he leaves wholly untouched many of the grave dangers that would occur in establishing the policy he advocates, he does, nevertheless, hit upon many of the weak places in our present railway system. We fancy that ten or twenty years hence the fight over the adoption of Government ownership may turn largely on the extent to which present-day railway officers can succeed in remedying the evils and abuses which at present exist.

In all the countries of the world outside of the United States and Great Britain, more than two-thirds of the railway mileage is now under Government ownership. In Great Britain a strong, popular sentiment in favor of the Government taking over the railways already exists. We repeat, therefore, that American railway officers ought to read such books as these and prepare themselves in the most effective manner for a campaign of public education, when it shall become necessary.

OREGON CONSERVATION COMMISSION.—Report to Governor, November, 1910. (J. N. Teal, Chairman, F. G. Young, Secretary.) Salem, Oregon: Pub. Doc. Paper; 6 x 9 ins.; pp. 55; one map.

In a comparatively few pages the Oregon Conservation Commission here submits an excellent review of the Conservation problems of the State. The Commission seems to have chosen for a motto "Let who will be critical, but let Oregon be constructive;" but this should not be interpreted as meaning that the Commission refrains from the exercise of judicious criticism of the conditions existing in Oregon. Forests, land and stream surveys, good roads, water transportation and water laws of Oregon are reviewed in succession, and pertinent recommendations are made regarding each subject. The water laws mentioned were passed in 1909, and seem well designed to conserve the waters of the State in the interests of the people and at the same time encourage their actual use.

Reference is made to the office of the State Engineer, which, it is said, "after six years of trial, has demonstrated its value to the State and has become one of our established institutions."

In conclusion, the Commission recommends the establishment of a State Forestry Service, co-operation between the State and Federal agencies "in gathering physical data on the State's natural resources and in the dissemination of the information so gathered," and finally, "an increase in the salary of the State Engineer to a figure commensurate with his duties and responsibilities."

MASSACHUSETTS STATE BOARD OF HEALTH.—Annual Report, 1908. (Henry P. Walcott, M. D., Chairman; William C. Hanson, M. D., Acting Secy.) Boston, Mass.: Pub. Doc. Cloth; 6 x 6¼ ins.; pp. 876; 13 plates and 3 maps.

A notable feature of this report is 300 pages devoted to "A Review of Twenty-One Years' Experiments Upon the Purification of Sewage at the Lawrence Experiment Station," by H. W. Clark and Stephen DeM. Gage. This sub-report was printed separately, in limited numbers, nearly a year ago (see notice in this Supplement for March 17, 1910, p. 35). In addition, the report contains the usual advice to cities, towns and individuals regarding water-supply and sewerage improvements, and the usual reviews of water-filtration experiments at Lawrence, examination of rivers of the State, dairy inspection, work of the bacteriological laboratory, the health of the State and various statistical summaries and abstracts from reports of local boards of health. The vital statistics given are for the year 1907. The main report covers the year ending Nov. 30, 1908. As we have observed in connection with other public documents, particularly reports of

state boards and departments of health, it seems a pity that so much delay should occur in presenting these reports to the public. It is only fair to add that the present volume was received by the editors late in September of the past year; but that lacked only two months of being two years after the close of the period covered by the main report, and only three months of being three years after the close of the period covered by the vital statistics.

New Zealand Experiments.

STATE SOCIALISM IN NEW ZEALAND.—By James Edward Le Rossignol, Professor of Economics in the University of Denver, and William Downie Stewart, Barrister-at-Law, Dunedin, New Zealand. New York: Thomas Y. Crowell & Co. Cloth; 5 × 7¾ ins.; pp. 311. $1.50, net.

The authors have presented a readable account of a series of interesting state experiments in government and industry undertaken by the far-away commonwealth of New Zealand. The study is by no means an argument for State Socialism. Rather, it appears to be an honest attempt to set forth actual conditions, with criticisms, favorable or unfavorable, according to the merits of each particular case.

After an introductory chapter entitled "The Functions of Government," in which some phases of the governmental history of New Zealand are reviewed, the authors take up in succession land tenure and monopoly, roads and railways, the public debt, the national land and income tax and also local taxation of land, State life and fire insurance and old-age pensions. Consideration is next given to "The Public Service," which in 1909 embraced some 40,000 employees, which was estimated to mean that "no less than 130,000 persons in the Dominion, out of a total population of about 1,000,000, were directly dependent on the State." The succeeding chapters deal with the Conciliation and Arbitration Acts, which have won New Zealand world-wide fame; a review of strikes during a period of some years; and a discussion of wages and the cost of living as affected by State Socialism and other conditions peculiar to New Zealand. The concluding chapter is a critical summary of all that preceded it.

Although many if not most of the experiments so interestingly described in this book have doubtless arisen from a sincere desire to bring the greatest good to the greatest number of the inhabitants of New Zealand, yet a perusal of the volume impresses one with the idea that after all the great underlying motive of the experiments has been based in the selfishness of individuals and of classes. The landless or those with little land have been contending with those who own vast areas. There have also been close struggles for other kinds of wealth, and everybody has been trying to shift the tax burden onto other shoulders.

So far as the authors can deduce from their detailed examination of the Parliamentary debates, newspaper discussion and various statistical reports, the people of New Zealand are remarkably prosperous and have a high average per capita wealth. Much of the prosperity depends upon the vast natural resources of this relatively new country, but the distribution of the national wealth among the masses of the people seems to be in a considerable part due to long-continued, governmental efforts to secure a goodly portion of it to every citizen. There has, however, been considerable mismanagement, particularly in connection with the public lands, the operation of railways and the conduct of the State Fire Insurance Department. Many of the faults pertaining to these activities have been due to a lack of proper financial and accounting methods, owing in turn to a desire to make a good present showing. All things considered, however, it seems remarkable that the people of New Zealand have done so well in their various State experiments.

The book deserves a wide circle of readers. It can hardly fail to interest anyone who is giving thoughtful attention to the many governmental and social questions now under consideration in his own particular state or county, wherever that may chance to be.

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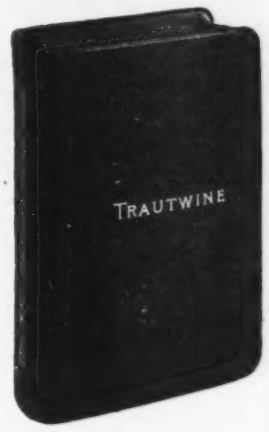

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Mining and Metallurgy.

Reviewed by F. W. TRAPHAGEN.*

PRACTICAL STAMP MILLING AND AMALGAMATION.—By H. W. MacFarren. First edition. San Francisco, Cal.: Mining and Scientific Press. London, England: The Mining Magazine. Cloth; 5¼ × 7¾ ins.; pp. 166; one illustration in text; indexed. $2, postpaid.

TESTING FOR METALLURGICAL PROCESSES.—By James A. Barr, B. S., M. E., Engineer of Construction and Maintenance for the Charleston, S. C., M. & M. Co. Formerly Instructor, Michigan College of Mines. First edition. San Francisco, Cal.: Mining and Scientific Press. London, England: The Mining Magazine. Cloth; 5¼ × 7¾ ins.; pp. 216; 23 text illustrations; indexed. $2, postpaid.

MORE RECENT CYANIDE PRACTICE.—Edited by H Foster Bain. First edition. San Francisco, Cal.: Mining and Scientific Press. Cloth; 6 × 9¼ ins.; pp. 424; 88 text illustrations and 3 tables; indexed. $2, postpaid.

Mr. MacFarren has collected within the covers of this book a vast amount of material which cannot fail to be of the highest value to those who have to do with the treatment of gold ores by the standard amalgamation process. The book is written in non-technical language, the descriptions are clear and easily comprehended, and the whole subject is presented in such a form as to be readily available to the practical mill workers to whose needs it seems to be especially adapted.

Chapter I. deals with the location and design of mills, with the selection of coarse crushing machinery, and with the construction of ore bins, battery frames, and mortar blocks. The modern tendency toward the use of concrete blocks is fully discussed, and directions based upon best current practice are given for building concrete mortar blocks which will be certain to meet all the requirements of milling work.

Chapters II. and III. treat of the parts of the battery: mortars, dies, shoes, bossheads, tappets, cams, cam shafts, guides, feeders, cam fingers, cam sticks, and screens, all being discussed in full, numerous pertinent suggestions as to best forms and practice being given.

Chapter IV. takes up water-supply, and the general details of operation. In this chapter the numerous variations in adjustment, to which the stamp battery is amenable, with reasons for and effects of such changes, are carefully considered and admirably handled.

Chapters V., VI., VII. and VIII. deal with the properties of mercury and its care, and the principles and practice of amalgamation. This subject is entered into very fully and includes the preparation of plates for amalgamation, the periodic cleaning up and dressing of plates, the retorting of amalgam, and the treatment of miscellaneous materials.

Chapters IX. and X. deal with losses occuring in amalgamation, tests and sampling, management of men and handling of materials.

A careful study of this book indicates that Mr. MacFarren is a close observer and is also able to place his observations in such form as to make them useful to others.

When one had occasion in the past to examine an ore to determine its amenability to various commercial methods of treatment, it was necessary, unless thoroughly familiar with small-scale testing, to search various authorities for suggestions and directions. Even then the directions would usually cover but one line of examination. The material was largely scattered through various texts and journals and Mr. Barr has done a good work in collecting, systematizing and improving this matter, beside adding material of his own.

The work contains clear descriptions of all the tests ordinarily called for, and in addition has a number of useful tables and schedules. It will prove especially valuable for the non-technical man who wishes to satisfy himself concerning the best method of treating his ore.

The third book before us is an extension of and companion to, "Recent Cyanide Practice," by T. A. Rickard, issued by the same publishers. The first book met with such favor that Mr. Bain was encouraged to bring Mr. Rickard's work up to date. The present volume contains many of the best articles written on the subject during the past three years and is well worth study by cyanide operators.

*Professor of Metallurgy and Assaying, Colorado School of Mines, Golden, Colo.

A Treatise on Welding.

WELDING: THEORY, PRACTICE, APPARATUS AND TESTS.—Electric, Thermit and Hot-Flame Processes. By Richard N. Hart, B. S. New York and London, England: McGraw-Hill Book Co. Cloth; 6½ × 9½ ins.; pp. 181; 93 illustrations in text. $2.50, net.

The main outline and general treatment of Mr. Hart's book are good, and he has compiled a vast amount of information and numerous data on the theory, practice, apparatus and tests of the different methods of welding many metals. The book is essentially only a compilation. Much, perhaps most, of the information can be obtained from trade publications. The careful reader may perhaps feel that some of the material might be condensed and that in a few instances substantial additions of more definite statements and data would be desirable if such could possibly be obtained. For instance, when the subject of smith welds of iron is discussed, the author fails to give any fair impression of the general reliability of these welds or of the extent to which they are employed in the arts. The tests of smith welds of iron are not very recent, the latest ones being ten or twelve years old, but this may be due to the feeling among engineers that these tests covered sufficient ground and that the data derived answer present demands so that more tests are unnecessary. Too little is said about the fluxes for smith welds of iron.

Under electric welding there is no reference to the so-called "spot" welding, as such, although the rail-welding apparatus of the Lorain Steel Co. is briefly described, and this company has developed a practice which is essentially "spot" welding. The rails themselves are not welded together but, to the ends of two abutting rails, bars are welded. The bars have three bosses rolled on one surface projecting about ⅛-in. from the bar. These bars are placed in position at the joint with the bosses against the web of the rails and the middle boss directly over the juncture of the webs of the two rails. The jaws of the welding clamp are brought down to straddle the rail and to engage the bars on either side the middle of the joint. The current is turned on and the boss is pressed into the web. After the three sets of bosses have been welded, it is true, no space remains between the bars and the rail web, as the bars are in close contact with the web over their entire surface, but the actual welding of bars to rail occurs in spots only.

The only reference to so-called "cast welding" seems to be in its application to rails. The so-called cast-welding methods have a variety of applications in foundry practice generally, typical examples of which are seen in the welding of steel magnet cores into the cast-iron yoke frame of many designs of electric generators and motors, and in making repairs. Mr. Hart might present information which would be appreciated by many of his readers as to the nature of the union in these cast-welding processes. Something definite also as to the extent to which these methods are in use might have been obtained by going to a little trouble. The locking information both here and under switch welds suggests that perhaps the author has had a limited field of experience in practical welding.

The foregoing are the only serious criticisms which can be made and these are seen to be sins of omission rather than commission. What has been printed in the book, notwithstanding these omissions, is useful and extremely readable and doubtless will be appreciated by a wide variety of readers who desire a knowledge of the subject which they can obtain otherwise only by wading through the files of technical publications for many years back.

The book, after the introductory paragraphs on definitions and theories, is divided into four main parts, taking up (1) the metals which can be welded, (2) electric welding, (3) hot-flame welding, and (4) the thermit processes.

Under the first part is found the information on smith welding of iron and on the working of nickel, copper, aluminum, gold, silver and platinum.

In the second part, on electric welding, the apparatus and its handling are taken up without particular regard to the metals welded.

Under the heading of "Hot Flame Welding," the so-called oxy-acetylene methods are described. Naturally, on account of the very recent development of these operations, it is necessary to place much dependence on manufacturers' statements and to use manufacturers' illustrations. At the same time, it is probable that the information so presented is fairly reliable, even though the statements are liable to be slightly prejudiced. The author has called attention to this, however, and warned his readers accordingly.

Some very interesting examples are given of work done with the thermit process, by which is meant, of course, the application of cast welding wherein the heat is derived from the combustion of a mixture of aluminum and iron oxide.

Under this main division are also placed brazing and soldering processes, although they seem to have no close resemblance to the thermit cast-welding methods.

A French Book on Earth Pressures as Affecting the Design of Structures.

POUSSEE DES TERRES.—Deuxieme Partie: Theorie des Terres Cohérentes. By Jean Resal, Inspecteur Général, Professeur a l'Ecole des Ponts et Chaussées. Paris, France; Ch. Beranger (15 Rue des Saints Peres). Paper; 6½ × 10 ins.; pp. 346; 116 cuts in the text and about 100 pages of tables. 15 francs; American price, $4.50.

The first part of this work, dealing with the equilibrium of soils lacking cohesion, was published in 1903, and presented methods of calculating the forces exerted upon retaining walls. Such soils include clean sand and gravel. As a rule, however, soil contains some proportion of clay or earth, so that practically engineers have nearly always to deal with soils possessing some element of cohesion. This, of course, has an important influence upon the pressures exerted against retaining walls.

The treatment of the subject is purely theoretical and mathematical, and the author has developed a series of formulas, with numerical results set forth in an extended set of tables. In the preface, however, it is stated that two engineers (Messrs. Jacquinst and Frontard) have undertaken to determine by direct experiment the cohesion and angle of repose of clayey soils. These experiments have been commenced, but have been delayed by defects in some of the measuring apparatus, but the first results are said to support the fundamental principles derived theoretically by the author.

The first chapter (108 pages) discusses the equilibrium of cohesive earth under various conditions. The second (40 pages) deals with earthwork; cuts, embankments, dams, slides, and the protection of slopes. The third chapter (70 pages) deals with retaining walls and the pressures which they sustain under varying conditions. No detailed designs are shown or described, but there is a section of the unusually thin wall (6 ft. thick and 34 ft. high) built by Brunel at the approach cut of the Micketton Tunnel (England). This had a small toe at the front, projecting 2 ft. from the wall; at the back (and about one-third of the height from the top) was a horizontal rib projecting about 4 ft., which served to anchor the wall against any tilting movement. The sliding of a wall on its base is dealt with under three conditions: (1) Where the wall tilts forward by the settlement of its toe; (2) where the wall settles bodily and is moved forward, but retains its vertical position; (3) where the wall tilts backward by settlement at its heel and a sliding outward of its base.

A short appendix discusses the movement of the bank forming the Charmes reservoir of the Marne & Seine canal. This bank was built in 1902-1906 and showed no sign of failure until Oct. 20, 1909, when a considerable sliding commenced which was not stopped for nearly two months. The lines of rupture developed by investigation are said to conform to the theoretical principles developed by the author.

A Revision of Hobart's "Electric Motors."

ELECTRIC MOTORS.—Continuous, Polyphase and Single-Phase Motors, Their Theory and Construction. By Henry M. Hobart, M. Inst. C. E., Consulting Engineer. Second edition, entirely rewritten, revised and enlarged. New York: The Macmillan Co. Cloth; 6 x 9 ins.; pp. 748; 798 text illustrations. $5.50, net.

The first edition of Mr. Hobart's important and much appreciated treatise was reviewed in these columns on Oct. 13, 1904, by Mr. B. A. Behrend. There has been much progress in certain lines of motor design since then and the book will be welcomed in its revised form. Some of the descriptions of older designs have been eliminated to make room for more recent work, but even then the number of pages has increased by nearly 200—40%. The commendable features of the earlier form have been retained and most of the criticisms of our reviewer have been satisfied in the edition at hand.

When this work first appeared in 1904, the variable-speed direct-current motor was attracting great attention, particularly for individual machine drives. In the first edition Mr. Hobart gave very scant attention to this development, but that lack has now been supplied. His remarks, because of his great reputation as a designer of electrical machinery, we believe will everywhere be appreciatively read—even though they may be construed as severe upon a number of American designers.

His argument in this matter is that the auxiliary commutating pole (the "interpole") has been overlooked; that it has been applied where good commutation could be secured for wide ranges of speed by using a more ordinary and less expensive motor. Mr. Hobart claims, and his work gives weight to the claim, that the reactance voltage of the armature coils needs only to be kept down, by making the commutator segments of a machine as numerous as possible and by making the cross section of the magnetic circuit, linked by each turn of an armature conductor, as small as possible.

It must not be supposed, however, that Mr. Hobart scorns the interpole for extreme ranges of speed for a given output. He has included a chapter on the design of interpole motors, which summarizes his experience and pictures typical examples of these designs. The author's ideas concerning such direct-current motors is best shown by a quotation (from p. 208):

> A motor of 400 HP. for 250 volts at 1,500 r. p. m., should employ interpoles, since an ordinary design with thoroughly good commutation is impossible. Good designs without interpoles are quite practicable for a motor of, say, 200 HP. and 250 volts at 1,000 r. p. m., but still better designs, as regards cheapness and satisfactory operation could be made by employing interpoles. Coming down to motors of 100 HP., 250 volts and 1,000 r. p. m., the advantage of interpole designs is but slight and for rather lower outputs and speeds, but for 250 volts, there would be no choice. For still lower outputs and speeds, for 250 volts, the interpole design becomes the more expensive. A 100-r. p. m. design, for 250 to 500 volts, would best be met without the use of interpoles even in larger capacities. At 200 r. p. m. and 500 volts, interpoles are desirable from, say, 200 HP. upward; and at the same speed, but for 250 volts, from, say, 400 HP. upward. . . .
>
> Generally speaking, when heating and not commutation is the limiting consideration, the cheapest and best design will be without commutating poles, and vice versa when commutation is the limit.

In the first edition, the discussion of alternating-current motors dealt with the polyphase induction motor alone. The scope of the treatment has been greatly enlarged in this edition though the preponderance of matter is on polyphase induction motors. Synchronous motors (reversed alternating-current generators) are not taken up at all.

The discussion of the single-phase induction motor is short and general and not very favorable to that type. The single-phase, series, commutator motor is similarly discussed.

The Thomson, Atkinson, Latour-Winter-Eichberg and Déri repulsion motors are described and their principles are compared. The Déri motors, as developed by Brown, Boveri & Co., for textile, crane and railway services, are given a more complete treatment than the others.

Finally, the multitude and variety of motor designs is to be remarked upon. American and European designs are brought together, with such analyses of data of design and performance, that comparison of practice is facilitated. All the praise that was given the author for his

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industry in preparing a work of the scope of the original, may well be repeated now that he has brought it up to date.

Sewage Works Apparatus and Design.

SEWAGE DISPOSAL WORKS.—Their Design and Construction. By W. C. Easdale, M. S. E., M. R. San. I. Author of "The Practical Management of Sewage Disposal Works." New York: Spon & Chamberlain. London, England: E. & F. N. Spon, Ltd. Cloth; 5½ × 8¾ ins.; pp. 256; 155 illustrations in text. $4, net; English price, 10s.

Books on sewage treatment are multiplying rapidly of late. The volume now before us deals largely with apparatus which is either actually in use or has been promoted for use in connection with sewage-purification works in Great Britain. In addition, attention is paid to what may be termed the elements of the design of sewage-purification works. Little is said about the underlying principles of sewage purification, or the engineering principles governing structural design. A large portion of the space of the volume, as will be mentioned again later, is devoted to illustrations.

So far as is practicable, the author takes up the different elements of a complete plant for the treatment of sewage in their logical order. Thus he begins with screens, and, before taking up detritus tanks, inserts a brief chapter on storm-water overflows, which latter, in the British scheme of sewage treatment, would naturally come between screens and detritus tanks. At the close of the chapter on detritus tanks, apparatus for removing deposits accumulating in those tanks are described.

The next chapter deals with plain sedimentation, septic, and chemical precipitation tanks. The "Dortmund" tank is mentioned here, but of the relatively small amount of space devoted to it in the book, most of it is assigned in the chapter on detritus tanks. Of the five pages given to the hydrolytic tank of Travis, two are occupied with line drawings, descriptive of a new type of tank, circular in form and more complex in design than the original hydrolytic tank.

The "Imhoff" tank has only two pages. Other new tanks are described under the headings Skegness, Candy-Whittaker bacterial tank, Non-Septic Cylinder, "Kessel" tank, "Separator" tank and "Fieldhouse" tank. Some three pages on Dibdin slate beds are included at the close of the chapter on tanks.

In the chapter on "Sludge Disposal" brief descriptions of chemical mixers and of the centrifugal Schaefer-ter Mer sludge-drying apparatus are included.

By far the longest chapter in the book is the one on "Percolating Filters." In this chapter and also in the one on "Contact Beds" the author gives his readers considerably more of the benefit of his personal experience and ideas than in any other portion of the book, and these chapters are, therefore, correspondingly more valuable. Particular attention is given to false floors and under-drainage systems of percolating filters and to various types and makes of distributing apparatus for applying the sewage to the filters. Dosing apparatus also is given ample attention.

Between the chapters on "Percolating Filters" and "Contact Beds," there are two brief chapters, one on settling tanks or humus pits for the effluent from percolating filters and one on sand filters. Under contact beds the author urges the use of false floors as being nearly as essential as in the case of percolating filters. Automatic apparatus for charging contact beds is considered in detail.

Considering the brief space devoted to the subject (five pages), a chapter entitled "Capacity of Percolating Filters and Contact Beds" is, perhaps, as notable as any single chapter in the book. This is due in part to the insertion of a table with the following title: "Table, Giving the Ratio of the Total Cubic Capacity of Percolating Filters and Contact Beds to the Daily Dry Weather Volume of the Sewage Under Varying Conditions." Ratios are given for both percolating filters and contact beds, subdivided in each case under strong, average, and weak sewages, and further subdivided into coarse and fine-grain material for percolating filters, and into single-, double-, and triple-contact beds. The ratios in the various columns are presented for plants having preliminary treatment in the nature of detritus tanks, septic tanks, plain sedimentation, and chemical precipitation tanks, and the two last-named are further subdivided into those designed for quiescent settlement.

Finally, there are three chapters, of six to eight pages each, dealing with "Storm-Water Treatment," "Measuring Apparatus" (including weirs, "Venturi" meters, etc.), and the "Sterilization of Sewage Effluents."

More than a third of the entire space of the volume is occupied with illustrations, or, approximately, 95 out of the 256 pages. Most of the illustrations are diagramatic in character, or else are half-tone reproductions of photographs. The author seeks to justify his practice in this particular by stating that, although illustrations from drawings of actual works "are interesting and valuable to a certain extent, their application under other conditions is limited, and their usefulness is thus much reduced." He adds that his diagramatic illustrations will serve "as suggestions to engineers in search of ideas which they can adapt to meet the requirements of any particular scheme upon which they may be engaged," leading the engineer to "rely upon his own practical experience and judgment" in the design of works. While there is undoubtedly some advantage in this method of illustration, an examination of the book, combined with the fact that the book is in reality a reprint of a series of articles appearing in "Surveying and the Civil Engineer," leads one to believe that the use of so large a proportion of diagramatic illustrations was largely due to the convenience with which illustrations to fit this scheme could be taken from trade catalogs. It is only fair to add, however, that where no proprietary device whatever is involved, the author has also introduced a large number of diagramatic sketches, particularly in connection with the general design of tanks and the walls of filter beds.

Where the diagramatic sketches have any lettering whatever, the author has generally confined himself to the old-fashioned and troublesome method of using reference letters in combination with text descriptions, instead of using words or phrases describing the parts of the apparatus under discussion. This is especially annoying in the description of the new type of hydrolytic tank, particularly since the lettering on the original drawings was not suitable for reproduction, so that it is next to impossible to follow out the descriptions without using a magnifying glass. The apparent inability of many authors and publishers to properly letter and figure drawings for reproduction largely explains the too common adherence to the old system of reference letters to indicate the various parts of the apparatus being illustrated.

The book, as a whole, although almost entirely confined to British practice (there are some illuminating references to American practice), promises to be useful on this side of the water. It is true that many of the illustrations and descriptions of special apparatus will be of no earthly use here—and it is doubtful if they served any useful purpose in their original publication in the journal named, save to make the editors and publishers stand well with actual or possible advertisers. American readers, however, will be glad to have brought together in handy form illustrated descriptions of many of the devices shown.

The usefulness of the portions of the book devoted to descriptions of proprietary apparatus would have been greatly increased had the author felt free to criticize discriminatingly. Although he does not hesitate to weigh and balance at other points, he is generally very chary in his criticism of proprietary apparatus. As a rule, the most he says is a few words of general praise. One cannot but think that this failure to give helpful criticism of apparatus is due to original publication in a journal which was seeking to increase its advertising patronage, and also to the inclusion of advertisements in the book itself. The value of the book would have been materially increased had the author omitted mention of some of the apparatus noticed and used his space for fuller and more critical descriptions of what remained.

Gasoline Motor-Car Details.

THE PRACTICAL DESIGN OF MOTOR CARS.—By James Gunn, Lecturer on Motor-Car Engineering at the Glasgow and West of Scotland Technical College. New York: Longmans, Green & Co. London, England: Edward Arnold. Cloth; 5½ × 8¾ ins.; pp. 256; 162 illustrations in text. $3, net.

A large amount of good material is presented here on the form and proportions of gasoline motor car details. The first half of the book is devoted to engines and their appurtenances, and the last half to clutches, transmissions, drives, axles, wheels, brakes, steering gear, frames and springs.

Proportions of engine parts are given either in terms of some principal diameter or by means of line cuts from which dimensions can be scaled. Computation of stresses is made subordinate to dimensions established by practice and small effort has been made to reconcile the computations suggested with the proportions set down empirically. This does not apply so strongly to the second half of the book, where the analytical method is adhered to for the design of such details as clutches and axles.

The worst thing about the book is its first chapter, entitled "Self-Propelled Vehicles; Their Motive Powers and General Principles." This is written much more discursively than the rest of the book, and the author expresses here many opinions supported only by broad statements, which cannot but arouse disagreement. It is stated for example, that "no doubt, in the near future, when the deficiencies of the present system of raising and using high pressures and highly superheated steam have been removed, it will become the universal power for all types of vehicles." One or two absolute misstatements of fact occur: the electric motor car is dismissed from consideration with the remark that "steam or petrol are the only two agents used to such an extent as to make the vehicles marketable articles." The statements quoted, and some others equally curious, scarcely inspire confidence in the breadth and extent of the author's observation and experience in this field.

MECHANICAL DRAWING FOR PLUMBERS.—A Concise, Comprehensive and Practical Treatise on the Subject of Mechanical Drawing, in Its Various Modern Applications to the Work of All Who Are in Any Way Connected with the Plumbing Trade. By R. M. Starbuck, Author of "Modern Plumbing Illustrated," "Standard Practical Plumbing," etc. New York: The Norman W. Henley Publishing Co. Cloth; 6¼ × 9¼ ins.; pp. 111; 150 illustrations in text (specially drawn). $1.50, net.

This is the first attempt, so far as we are aware, to prepare a book on mechanical drawing especially for plumbers. Methods of representing the various fixtures and fittings are explained and illustrated, and the use of drawing instruments is concisely described. Plans for the complete plumbing of a residence and of an apartment house are shown and discussed. Some space is given to steam-pipe drawings for heating systems. The book will be found of value for the information on design, indirectly conveyed by the illustrations, as well as for the instruction in drafting.

A TEXT-BOOK OF ELEMENTARY FOUNDRY PRACTICE.—For the Use of Students in Colleges and Secondary Schools. By William Allyn Richards, B. S. in M. E., Jr. Mem. A. S. M. E. New York: The Macmillan Co. Cloth; 6 × 8¾ ins.; pp. 121; 122 illustrations in text; 1 appendix. $1.25, net.

A degree of literary ability quite foreign to most of the school text-books on foundry practice which have come to our attention is shown by the author of this book. The material presented is well chosen, intelligently arranged and intelligibly written. A brief introductory page gives an outline of the several branches of foundry practice. This is followed by chapters on materials used for molds, on tools and on principles of molding. In the chapter on tools, suggestions are given for the suitable equipment of a school foundry. Then come eight chapters on specific molding exercises, classified according to the materials and implements required in molding them. Chapters on cupola practice, on clean-

ing castings, on chilled and malleable castings and on brass molding complete the text. The usual glossary of technical terms is added and an appendix devoted to tabulated data and re-

GENERAL SPECIFICATIONS FOR CONCRETE BRIDGES.—By Wilbur J. Watson, Civil and Architectural Engineer. Second Edition. New York: Engineering News Publishing Co. Stiff paper; 8¼ × 11 ins.; pp. 66; tables. $1, net.

This second edition of these specifications shows a great improvement over that first issued some two years ago. The present arrangement is much better and the treatment more orderly, while the developments of the last two years in the way of Committee reports and uniform rules have helped the author to reduce his specifications more nearly to universal standard than was possible in the original edition. For the field of concrete bridges it now compares very favorably with the analogous specifications on steel bridges by Mr. Theodore Cooper.

NATIONAL ASSOCIATION OF CEMENT USERS.—Proceedings of the 6th Annual Convention held at Chicago, Ill., Feb. 21-25, 1910. Vol. VI. Edited by Richard L. Humphrey, President. (Edward E. Krauss, Secy., Harrison Bldg., Philadelphia, Pa.) Philadelphia, Pa.: The Association. Paper; 6 × 9 ins.; pp. 738; 6 folding plates and numerous text illustrations.

As is well known by those who have attended the sessions of the National Association of Cement Users and as might be inferred by those who have read our accounts of these sessions, there is each year presented a vast amount of valuable material which can not be digested by the hearer but which must be read at leisure to be appreciated. This includes the discussion on the floor as well as papers illustrated and explained by views, drawings and tables. The compilation of all this matter is a useful work, which adds measurably to the desirable literature of concrete and the editors are to be complimented on the admirable fashion in which it has been done. If the publication could be made to follow more closely in its date of issue the convention which it represents the value of the work would undoubtedly be increased.

DIE BAUMASCHINEN.—IV. Teil des Handbuchs der Ingenieurwissenschaften. Erster Band: Einleitung, Baggermaschinen, Rammen und zugehörige Hülfsmaschinen, Wasserhebemaschinen. Bearbeitet von H. Weihe und O. Berndt. Herausgegeben von H. Weihe, Professor an der Technischen Hochschule in Berlin. Dritte, vermehrte Auflage. Leipzig, Germany: Wilhelm Engelmann. Paper; 7½ × 11 ins.; pp. 471; 14 folding plates; 306 illustrations in text. 24 marks; American price, $9.60.

Three classes of contractor's machinery are treated in this work: Dredges and Steam Shovels, Pile drivers and their auxiliaries, and Pumps. Since each of the three affords material for a bulky treatise, it will be understood that the text is a descriptive study only, with occasional theoretical or critical considerations. The user's viewpoint rather than that of the designer is taken. The present is a third edition, but is largely rewritten, by new collaborators.

TESTS OF AN E2A LOCOMOTIVE.—Test Department, Locomotive Testing Plant at Altoona, Pa., 1910. Bulletin No. 5. Altoona, Pa.: Pennsylvania Railroad Co. Paper; 5¾ × 9 ins.; pp. 115; six folding plates; numerous text illustrations; tables; appendix.

This pamphlet contains complete data of the performance of an Atlantic locomotive of the two-cylinder simple type tested on the Altoona locomotive testing plant of the Pennsylvania R. R., which was originally installed at the St. Louis Exposition in 1904. At St. Louis tests were made on four locomotives of the four-cylinder compound Atlantic type, but lack of time prevented the completion of the series with the tests on a simple locomotive of the same type. The present pamphlet, therefore, is really a supplement to the book "Locomotive Tests and Exhibits" issued by the Pennsylvania R. R. after the close of the St. Louis Exhibition.

Comparing the results of these tests with the results on a closely similar compound locomotive at St. Louis, it appears that the compound uses somewhat less steam at all powers; but at high speeds the saving of the compound over the simple is comparatively small.

The pamphlet is issued from the office of A. W. Gibbs, General Superintendent of Motive Power of the Pennsylvania R. R. at Altoona.

TURBINES A VAPEUR.—By Le Commandant F. Cordier, Chef D'Escadron, a la Section Technique de L'Artillerie, Ingenieur-Electricien de L'Institut Electrochimique de Grenoble. Paris, France: Octave Doin & Sons, (8, Place de L'Odeon). Cloth; 4¾ × 7¼ ins.; pp. 400; 118 illustrations in text. 5 francs; American price, $1.00.

For those who read French, the above book affords a convenient short text on steam turbines. The chief part is descriptive of construction, arrangement and detail of turbines and turbine installations, including some matter on marine turbines. A section on steam and its behavior is prefaced to the descriptive section.

FREIGHT TRAIN RESISTANCE.—Its Relation to Average Car Weight. By Edward C. Schmidt, Professor of Railway Engineering. Bulletin No. 43. University of Illinois, Engineering Experiment Station. Urbana, Ill.: The University. Paper; 5¾ × 9 ins.; pp. 132; 50 illustrations in text. 60 tables.

The main facts in this pamphlet were made public last May in a paper read at the Atlantic City meeting of the American Society of Mechanical Engineers. Similar facts were presented in a bulletin issued by the American Locomotive Co., which was abstracted and commented on in our issue of March 10, 1910.

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PRINCIPLES OF ELECTRICAL ENGINEERING.—By Harold Pender, Ph. D., Professor of Theoretical and Applied Electricity, Massachusetts Institute of Technology. Preliminary edition. New York and London: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 340; 126 illustrations in text. $4, net.

This volume is designated on the title page as a "Preliminary Edition." One is at a loss to understand such a peculiarity of the publishers if the book is to be placed on sale generally. Perhaps the very formidable errata sheet inserted before the title page has some relation to the legend "Preliminary Edition."

If the book is given only a rapid survey it might appear to be a physicist's exposition of phenomena, principles and theories making up the foundation of electrical engineering. But a careful reading dispels this impression. There is no tendency toward the inclusion of matter of the "knitting work" variety. The topics all have a distinct bearing on present practice. The discussions, in general, are concise and as simple as can be expected.

Great care has been given to the development of analogies in describing electrical phenomena, but Prof. Pender is careful to state that such analogies do not explain the mechanism of the electrical similarities. The book seems especially adapted to the needs of those teachers who are breaking away from lecture methods and endeavoring to force the students to assimilate prepared texts. It is evident also that Prof. Pender has listened to the complaints of many teachers of electrical engineering who find their students not coming to them properly prepared in the fundamental concepts of physics. His first 25 pages develop certain axiomatic assumptions which he calls "articles of scientific faith." Here are short dissertations on such topics as length, area, volume, time, velocity, mass, acceleration, momentum, vector quantities, force, work, power, temperature, heat, gravitation, etc.

The author, after these preliminary sketches, immediately gets down to the explanation of electrical phenomena, starting with magnetism and direct currents, following with electromagnetism, electrostatics, and variable and alternating currents in the order named.

In the chapter on magnetism, force concepts are followed until the ideas of flux of magnetic force can be developed and from there on the arguments are shortened by the use of such terms as "magnetic flux" and "lines of force" in place of the more direct and cumbersome ideas of force reactions.

In the chapter on continuous currents, the grasp of current, voltage and work relations is approached through the hydraulic analogy of loss of potential along a pipe carrying water. Ohms law is developed from potential-drop deductions and the idea of electromotive force is derived from a consideration of gain or loss of electric energy at some point or points, distinct from the formation of heat. In presenting the production of e. m. f. by induction, this idea of gain of electrical energy, and the absorption of other energy, at distinct points is further used. Thus the work of moving a conductor across a magnetic field is calculated, and as this is transformed into electrical energy the average electric potential is found by dividing by the current forced and the time occupied.

Similar observations might be made on some interesting points about the discussions of alternating-current phenomena. Time and again, the author has developed his argument from the basic statement that "experiment shows" this or that state of affairs or "experiment justifies the assumption," etc.

A peculiar nomenclature is used throughout the book. The subscript of a symbol is made to indicate direction, distance, or extent. Thus, in an electric circuit, the voltage drop due to resistance between points 1 and 2 is indicated as v_{12}, and the current flowing in this circuit or in this part of a complex circuit would be I_{12}. If I_{21} and v_{21} are used the idea conveyed is of current and voltage reversed in direction. In a circuit having three points of reference, 1, 2, and 3, the resistances would be designated R_{12}, R_{13}, R_{23}. The distinction between the practical and C. G. S. units of potential, resistance, current, etc., is made by using the terms ohms, abohms, volts, abvolts, amperes, abamperes.

DIE DYNAMISCHEN WIRKUNGEN DER WELLENBEWEGUNG AUF DIE LANGSBEANSPRUCHUNG DES SCHIFFSKORPERS.—By Dr. Ing. Fritz Horn. Berlin, Germany: Julius Springer. Paper; 7½ × 11 ins.; pp. 118; three folding plates and 29 text illustrations. 3 marks; American price, $1.20.

This is a mathematical study of the change in distribution of forces on a ship which crosses a set of waves at right angles, due to the non-sinusoidal form of the wave and to the fact that the hydrostatic subsurface pressure in the waves is not proportional to depth.

AMERICAN WATER WORKS ASSOCIATION.—Proceedings of the 30th Annual Convention, held at New Orleans, La., April 26-30, 1910. Charleston, S. C.: The Association (John M. Diven, Secy.-Treas., 14 George St.) Cloth; 6¼ × 9¼ ins.; pp. 292; numerous folding and other plates and text illustrations.

Those who have watched with consternation the increasing bulk of the Proceedings of this Association and the corresponding financial difficulties into which the organization has been drifting will be pleased to see that the present volume is materially reduced in size. The pleasure will be all the greater when it is known that there is little, if any, decrease in the value of the volume as compared with earlier ones. A considerable amount of additional saving might have been effected by cutting out some large folding plates entirely and reducing most of the others in size. In fact, judicious editing, combined with the work of draftsmen experienced in preparing illustrative material for reproduction, would have eliminated practically all of the folding plates, since, as already intimated, many of the illustrations could have been spared entirely, while others could have been reduced so as to be included in the text. If the rules of the Society had been strictly enforced and all text and illustrations of papers submitted to the Publication Committee before advance copies were printed, doubtless much of this curtailment in space devoted to illustrations would have been effected. Now that the size of the volume of Proceedings has been reduced, we see no reason why the convenience of the members might not be further served by including with the papers and discussions the other business transactions of the annual convention, together with list of members. A separation was made a few years ago, largely owing to the great bulk of the Proceedings.

The papers and discussions included in the volume deal with a wide range of water-works construction and operation. The report of the convention appeared in Engineering News, May 5, 1910, p. 535.

UTILIZATION OF CALIFORNIA EUCALYPTS.—By H. S. Betts and C. Stowell Smith, Assistant District Foresters, U. S. Department of Agriculture, Forest Service—Circular 179. (Henry S. Graves, Forester.) Washington, D. C.: Pub. Doc. Paper; 6 × 9¼ ins.; pp. 30; seven illustrations and four tables in text.

Useful information concerning eucalyptus trees and their products in California is presented in this pamphlet, the publication of which is timely, in view of the large amount of eucalyptus planting which has been done in California during the past few years and the extravagant claims made by promoters of plantations. While the eucalyptus affords a promising field for industry and investment, the pamphlet shows that much remains to be learned about the best methods of handling the timber, as well as its suitability to various uses.

THE JOURNAL OF THE MUNICIPAL SCHOOL OF TECHNOLOGY, MANCHESTER (England).—A record of Investigations Undertaken by Members of the Teaching Staff and Students of the School During MCMIX. Volume III. Manchester, England: The Education Committee. Stiff paper; 7¼ × 9¾ ins.; pp. 392; folding and other plates and numerous text illustrations.

All or nearly all of the many papers presented in this large volume have previously appeared in various periodicals. A useful purpose, however, is served in bringing them together in one volume, although the diversity of subjects treated makes the collection somewhat heterogeneous in character. Among the subjects included [illegible] following may be mentioned: "Experiment[illegible] upon the Forces Acting on Twist-Drills Whe[illegible] perating on Cast Iron and Steel," by Mr. [illegible] ister Smith and Prof. R. Poliakoff; "Experi[illegible]s on the Strength Properties of Reinforced [illegible]rete Beams," by Mr. W. C. Popplewell, M. Sc[illegible] Note on the Deflection Due to Shear," by M[illegible] C. Popplewell, M. Sc.; "Mechanical Ventilat[illegible] by Prof. J. Radcliffe, M. Sc. Tech.; "The D[illegible]s of Small Direct-Current Machines," by Mr[illegible] E. Stott, Assoc. M. S. T., and Mr. J. Ha[illegible]ove; "Single-Phase Railways," by Mr. P. C[illegible]nes. Other papers deal with investigations in th[illegible]lds of chemistry and industrial art.

It is interesting to note that the Journ[illegible] was printed in the Photography and Printing [illegible]ffs Department of the Municipal School of [illegible]ch-nology.

Publications Received.

AMERICAN CIVIL ENGINEERS' POCKET BOOK.—Editor-in-Chief, Mansfield Merriman. Associate Editors: Ira O. Baker, Charles B. Breed, Walter J. Douglas, Louis A. Fischer, Allen Hazen, Frank P. McKibben, Edward R. Maurer, Rudolph P. Miller, Alfred Noble, Frederick E. Turneaure, Walter Loring Webb, Gardner S. Williams. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Leather; 4½ × 7¼ ins.; pp. 1,380; 944 text figures and 493 tables. $5, net.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—Proceedings of the 43rd Annual Convention Held at Atlantic City, N. J., June 20-22, 1910. (Jos. W. Taylor, Secy., 390 Old Colony Bldg., Chicago, Ill.) Cloth; 6 × 9 ins.; pp. 600 numerous folding plates and text illustrations; tables.

THE ANALYSIS OF PAINTS AND PAINTING MATERIALS.—By Henry A. Gardner, Director, Scientific Section, Educational Bureau, Paint Manufacturers' Association of the United States, and John A. Schaeffer, Instructor in Chemical Practice, Carnegie Technical Schools, Pittsburg, Pa. New York and London: McGraw-Hill Book Co. Cloth; 6 × 9¼ ins.; pp. 100; two text illustrations; five tables; two appendixes. $1.50, net.

AUTOMOBILE MECHANICS' CATECHISM.—A Series of Examination Questions and Answers Prepared Expressly for the Use of Owners, Chauffeurs, Garage Men, and Automobile Machinists. By Calvin F. Swingle, M. E. Chicago, Ill.: Frederick J. Drake & Co. Leather; 4¼ × 6¾ ins.; pp. 110; two folding plates. $1.25, net.

BIRTHS, MARRIAGES AND DEATHS IN THE PROVINCE OF ONTARIO.—For the Year 1908. (W. J. Hanna, Registrar-General). Toronto, Ont.: Pub. Doc. Paper; 6½ × 9½ ins.; pp. 295; tables.

CANADA DEPARTMENT OF MINES, MINES BRANCH.—Ottawa, Canada: Pub. Doc. Paper; 6½ × 9¾ ins.

THE PRODUCTION OF COAL AND COKE IN CANADA, 1909.—By John McLeish, B. A., Chief of the Division of Mineral Resources and Statistics. Pp. 36; tables.

THE PRODUCTION OF COAL AND COKE IN CANADA, 1909.—By John McLeish, B. A., Chief of the Division of Mineral Resources and Statistics. Pp. 36.

THE CARE OF TREES IN LAWN, STREET AND PARK.—With a List of Trees and Shrubs for Decorative Use. By Bernard E. Fernow, Dean of the Faculty of Forestry, University of Toronto. New York: Henry Holt & Co. Cloth; 5¼ × 8 ins.; pp. 392; frontispiece and 115 illustrations in text. $2, net.

CHIEF INSPECTOR OF MINES, STATE OF OKLAHOMA.—Second and Third Annual Reports, from Nov. 1, 1908, to June 30, 1909, and July 1, 1909, to June 30, 1910. Pete Hanraty, Chief Inspector of Mines. McAlester, Cal.: Pub. Doc. Cloth; 6 × 9¼ ins.; pp. 210; 8 illustrations.

THE COKE INDUSTRY OF THE UNITED STATES AS RELATED TO THE FOUNDRY.—By Richard Moldenke. Bulletin No. 3, Department of the Interior, Bureau of Mines; Joseph A. Holmes, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 32.

COMMISSIONER OF EDUCATION.—Report for the Year Ended June 30, 1910. (Elmer Elsworth Brown, Commissioner.) Volume I. Washington, D. C.: Pub. Doc. Cloth; 5¾ × 9¼ ins.; pp. 662.

DRYING MACHINERY AND PRACTICE.—A Handbook on the Theory and Practice of Drying and Desiccating, with Classified Description of Installations, Machinery and Apparatus; Including also a Glossary of Technical Terms and Bibliography. By Thomas G. Marlow, Grinding, Drying, and Separating Machinery Specialist. New York: D. Van Nostrand Co. London, England: Crosby Lockwood & Son. Cloth; 6 × 9¼ ins.; pp. 326; 17 folding plates; 174 illustrations in text; 22 tables. $5, net.

DIE EISENBETONPRAXIS.—Ein Leitfaden fur Techniker und Architekten. By E. Nicolas, Ingenieur. Wien and Leipzig, Germany: A. Hartleben's Verlag. Paper; 6¼ × 9¼ ins.; pp. 317; 301 illustrations in text. 8 marks; American price, $3.20.

ELECTRICIANS' OPERATING AND TESTING MANUAL.—A Hand Book for Men in Charge of Electrical Apparatus, Repair Men, Trouble Men, Lamp Trimmers and Electricians Generally. By Henry C. Horstmann and Victor H. Tousley, Authors of "Modern Wiring Diagrams and Descriptions," "Modern Electrical Construction," etc. Chicago, Ill.: Frederick J. Drake & Co. Leather; 4½ × 6¾ ins.; pp. 359; 211 illustrations in text. $1.50, net.

ELEKTROTECHNISCHE WINKE FUER ARCHITEKTEN UND HAUSBESITZER.—By Dr.-Ing. L. Bloch and R. Zaudy. Berlin, Germany: Julius Springer. Cloth; 5¼ × 8¾ ins.; pp. 151; 99 text figures. 2.8 marks; American price, $1.20.

(Continued on p. 16.)

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ELEMENTS OF A CONSTRUCTIVE FRANCHISE POLICY.—A Paper Read Before the National Municipal League, at the Buffalo Meeting, Nov. 15, 1910. By Delos F. Wilcox, Ph. D., Chief of the Bureau of Franchises of the Public Service Commission for the First District, New York, and Author of "Municipal Franchises." New York: The Author (154 Nassau St.) Paper; 6 × 8¾ ins.; pp. 22.

ELEMENTS OF ELECTRICITY FOR TECHNICAL STUDENTS.—By W. H. Timbie, Instructor in Industrial Electricity, School of Science and Technology, Pratt Institute, Brooklyn, N. Y. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¼ × 7¾ ins.; pp. 556; 415 illustrations in text; appendix. $2, net; English price, 8s. 6d., net.

ENGINEERING DESCRIPTIVE GEOMETRY.—A Treatise on Descriptive Geometry as the Basis of Mechanical Drawing, Explaining Geometrically the Operations Customary in the Drafting Room. By F. W. Bartlett, Commander, U. S. Navy; Head of Department of Marine Engineering and Naval Construction at the United States Naval Academy, and Theodore Johnson, A. B., M. E., Professor of Mechanical Drawing, United States Naval Academy; M. Am. Soc. M. E. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 6 × 9¼ ins.; pp. 159; 137 illustrations in text. $1.50, net.

ENGINEERING MATHEMATICS.—A Series of Lectures Delivered at Union College. By Charles Proteus Steinmetz, A. M., Ph. D.; Past President of American Institute of Electrical Engineers. New York and London, England: McGraw-Hill Book Co. Cloth; 6 × 9¼ ins.; pp. 292; 92 illustrations in text; two appendixes; two tables. $3, net.

FOWLER'S MECHANICS' AND MACHINISTS' POCKET BOOK AND DIARY, 1911.—A Synopsis of Practical Rules for Fitters, Turners, Millwrights, Erectors, Pattern Makers, Foundrymen, Draftsmen, Apprentices, Students, etc., etc. Edited by William H. Fowler, Wh. Sc., M. Inst. C. E., M. I. Mech. E., M. Iron & Steel Inst. Manchester, England: Scientific Publishing Co. Linen; 4 × 6 ins.; pp. 456; numerous illustrations and tables in text. 6d., net; post free, 8d.; American price, 50 cts.

HYDRAULIC TURBINES.—Their Design and Installation. By Viktor Gelpke, Chief Engineer, Turbine Department, Amme, Giesecke and Konegan A-G., and A. H. Van Cleve, M. Am. Soc. C. E.; M. Am. Soc. Testing Materials; Former Consulting Engineer, Niagara Falls Power Co. New York and London, England: McGraw-Hill Book Co. Cloth; 7 × 9¼ ins.; pp. 293; 200 illustrations in text. $4, net.

THE INDICATOR HANDBOOK: A PRACTICAL MANUAL FOR BEGINNERS.—Part I.—The Indicator: Its Construction and Application. By Charles N. Pickworth, Whitworth Scholar; Editor of "The Mechanical World"; Author of "The Indicator Diagram: Its Analysis and Calculation," "The Slide Rule," etc. Fourth edition, revised and enlarged. New York: D. Van Nostrand Co. London, England: Whittaker & Co. Cloth; 5 × 7½ ins.; pp. 142; 93 illustrations in text. $1.50, net; English price, 3s., net.

INDUSTRIAL ACCIDENTS.—A Select List of Books. Pittsburg, Pa.: Carnegie Library. Paper; 6 × 9 ins.; pp. 12.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.—Proceedings of the 15th Annual Convention Held at Rochester, N. Y., Sept. 6-9, 1910. Houston, Tex.: Clarence R. George, Secy. Cloth; 6 × 8¾ ins.; pp. 170; 18 photographs (Officers).

LONG DISTANCE TRANSMISSION OF STEAM AND ITS EFFECT ON POWER PLANT ECONOMICS.—By Halsten Joseph Thorkelson, M. E., Associate Professor of Steam Engineering, The University of Wisconsin. (Bulletin No. 347, Engineering Series Vol. VIII., No. III.) Madison, Wis.: The University of Wisconsin. Paper; 6 × 9 ins.; pp. 21; 12 illustrations. 25 cts.

MACHINE SHOP PRIMER.—An Introduction to Machine Tools and Shop Appliances, with Illustrations, Names and Definitions. By Fred H. Colvin, A. S. M. E., Associate Editor of the "American Machinist"; Author of "Machine Shop Arithmetic," etc., and Frank A. Stanley, Associate Editor of the "American Machinist," Author of "Accurate Tool Work," etc. New York and London, England: McGraw-Hill Book Co. Cloth; 6¼ × 9¼ ins.; pp. 148; 424 illustrations. $1, net.

MECHANICAL ENGINEERING ABSTRACTS.—Journal of the International Institute of Technical Bibliography. Vol. I., 1910. Published monthly. London, England: The Institute. Paper; 6½ × 9¾ ins. Subscription for non-members: One section 24s. yearly; six sections, 80s., post free.

THE "MECHANICAL WORLD" ELECTRICAL POCKET BOOK FOR 1911.—Containing a Collection of Electrical Engineering Notes, Rules, Tables and Data. Manchester and London, England: Emmott & Co., Ltd. Tokyo, Japan: Z. P. Maruya & Co., Ltd. Cloth; 4 × 6¼ ins.; pp. 270; 68 illustrations in text. 6d., net; American price, 50 cts.

MUNICIPAL CHEMISTRY.—A Series of Thirty Lectures by Experts on the Application of the Principles of Chemistry to the City, Delivered at the College of the City of New York, 1910. Edited by Charles Baskerville, Ph. D., F. C. S., Professor of Chemistry and Director of the Laboratory, College of the City of New York. New York and London: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 526; 251 illustrations in text. $5, net.

NAVY YEARBOOK.—Compilation of Annual Naval Appropriation Laws from 1883 to 1910, Including Provisions for the Construction of All Vessels of the "New Navy," with Tables Showing Present Naval Strength in Vessels and Personnel, and Amount of Appropriations for the Naval Service; Also Statistics of Foreign Navies. Compiled by Pitman Pulsifer, Indexer for Senate Public Documents. Washington, D. C.: Pub. Doc. Cloth; 6 × 9¼ ins.; pp. 774.

THE OHIO ELECTRIC LIGHT ASSOCIATION.—Proceedings of the 16th Annual Convention Held at Cedar Point, L. E., Ohio, July 26-28, 1910. (D. L. Gaskill, Secy.-Treas., Greenville, O.) Cloth; 6¼ × 8¾ ins.; pp. 175; eight plates and four illustrations in text; six tables.

PERMANENT INTERNATIONAL ASSOCIATION OF ROAD CONGRESSES.—Second Congress—Brussels—1910. In three volumes. Paris, France: M. Mahieu, Sec. Gen. de l'Association, 1, Ave. d'Iena.
Reports (Section I.): Construction and Maintenance. Sub-Division A.: Construction and Maintenance Outside the Large Cities and Towns. Sub-Division B.: Construction and Maintenance in the Large Towns. Papers, Nos. 1-54, inclusive.
Reports (Section II.): Use and Traffic. Papers, Nos. 55-67, inclusive. Communications (Sections I. and II.): Paper No. 1.: Special Report by J. E. Pennybacker, Jr., and papers, Nos. 2-42, inclusive. Cloth; 6½ × 19 ins.
General Reports: Containing papers, Nos. 1-9, inclusive. Paper; 6¼ × 9½ ins.; one folding plate.

RAILROAD COMMISSIONERS, STATE OF CONNECTICUT.—Annual Report, 1910; to Which Are Added Statistical Tables Compiled from the Annual Reports of the Steam Railroad Companies of the State for the Year Ended June 30, and of the Street Railway Companies for the Same Period. Hartford, Conn.: Pub. Doc. No. 12. Cloth; 6 × 9 ins.; pp. 525 + 176; two folding maps, in pockets.

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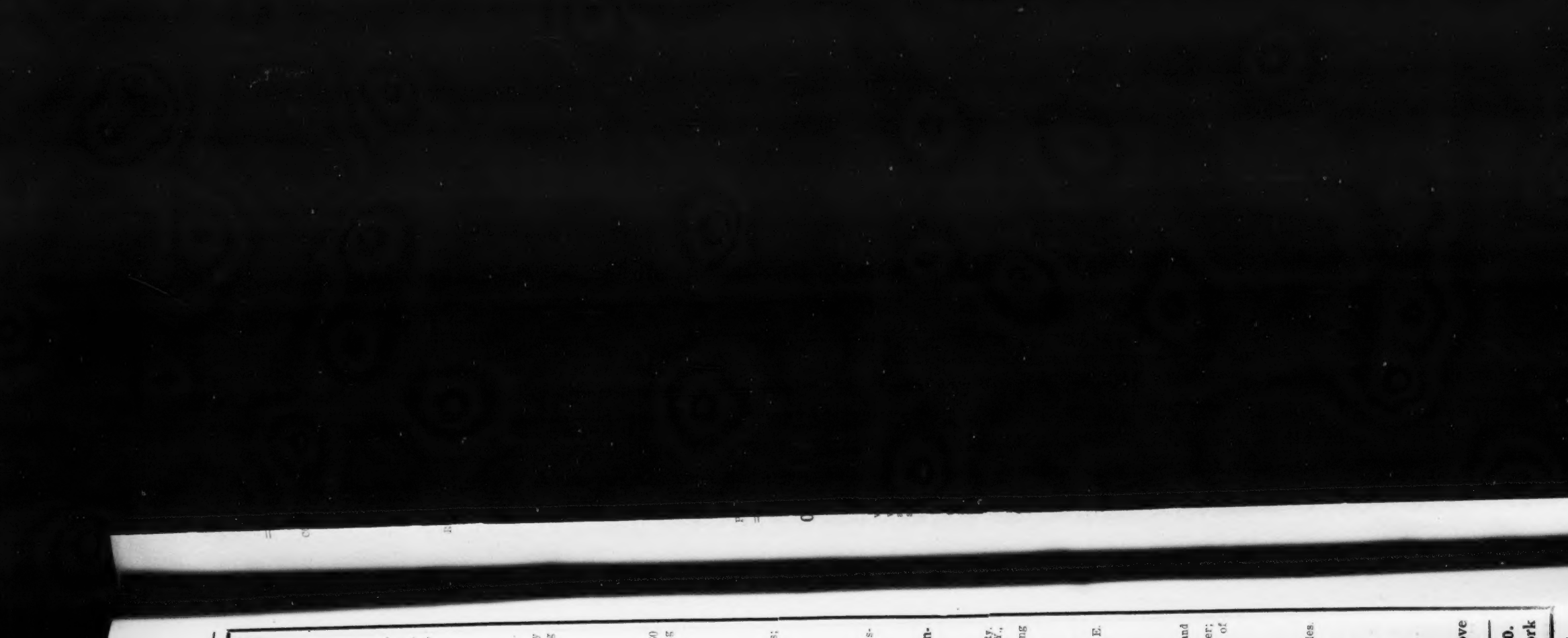
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